



# PORTSMOUTH INFORMATION RELEASE APPROVAL REQUEST

## I. Document / Information Description

(To be filled out by Requestor)

ID Number: 1205-01.06.01.01-00703

Originated Date: 5/2/08

Document Title or Identification: Final Cost Est. Report for Onsite Waste Disp. Fac

Original Author(s) / Organization: CDM

Technical Editor(s) / Organization: CDM

Format: ☒ Document: 89 Total # Pages

☐ Transparencies / Presentations

☐ Photos:      # Prints

☐ Electronic Media: type     

Audience: ☐ Public Meeting

☐ Private Meeting

☐ Presentation to Congress

☐ Distribution List

☐ Internet Publication

☒ Publication/Press Release

Justification: DOE wants to put on website for potential D&D bidders

Requestor: Amanda Mayo

Ext. 2669

Date: 5/2/08

Legible Signature or Print Name & Signature

## II. Patent, Classification and Protected Information Review

(To be completed by the PORTS Classification Office)

Patent / Proprietary  
Review:

☒ Does not Contain Patentable or Proprietary information

☐ Contains Patentable or Proprietary and/or has clearance patent information

Classification  
Review:

☒ Document is Unclassified

☐ Document is Classified

Sensitive Information  
Review:

☐ Contains Official Use Only (OUO)

☐ Contains Export Controlled (ECI)

☐ Contains Unclassified Controlled Nuclear Information (UCNI)

☐ Contains other Protected Information, describe:

## III. Information Release Approved or Denied

(To be completed by the PORTS Classification Officer)

☒ Approved for Public Meetings, Widespread Distribution, or Presentation to Congress

☒ Approved for Publication, Media Broadcast, and/or Public Website

☐ Approved for Internal Distribution Only

☐ Approved for Publication on the Internal Network only (access restricted to network users only)

☐ Not Approved for Release

☐ Approved with restrictions (describe):     

AH Thomas 5/15/08

Classification Officer/Technical Information Officer Signature / Date

Send to OSTI? ☐ Yes ☒ No

Note: Requestor must retain a record copy of all requests (approved or rejected) and material being released

U. S. Department of Energy

**Portsmouth Gaseous Diffusion Plant  
Decontamination and Decommissioning Project  
Scenarios I, II, IV, VI, and VIII**

August 31, 2006

*Final  
Cost Estimate Report  
for the Onsite Waste  
Disposal Facility*

**Final  
Cost Estimate Report for the Onsite Waste Disposal Facility  
at the  
Portsmouth Gaseous Diffusion Plant Decontamination and  
Decommissioning Project  
Scenarios I, II, IV, VI, and VIII**

August 31, 2006

Prepared by  
CDM Federal Programs Corporation

Prepared for  
U. S. Department of Energy  
Portsmouth/Paducah Project Office

# Contents

## Section 1 - Introduction and Purpose

1.1	Introduction.....	1-1
1.2	Purpose .....	1-1
1.3	Report Organization.....	1-2

## Section 2 - Cost Evaluation and Estimating Approach

2.1	Cost Evaluation Methodology .....	2-2
2.1.1	Pre-Disposal Costs.....	2-2
2.1.1.1	Preparation.....	2-2
2.1.1.2	Packaging .....	2-2
2.1.1.3	Transportation .....	2-2
2.1.2	Disposal Costs.....	2-3
2.1.2.1	Capital Construction Costs .....	2-3
2.1.2.2	Disposal Facility Operational Costs .....	2-3
2.1.2.3	Closure Costs .....	2-3
2.1.2.4	Short-Term Stewardship .....	2-3
2.1.2.5	Post-Closure/Long-Term Stewardship .....	2-3
2.2	Cost Estimating Approach .....	2-4
2.2.1	Direct Costs .....	2-4
2.2.2	Indirect Costs .....	2-4
2.2.3	Contingency .....	2-4
2.2.4	Escalation.....	2-4
2.2.5	Present Value Analysis.....	2-4

## Section 3 - Background Information and Cost Data

3.1	Background Reports.....	3-1
3.2	Disposal Facilities Used for the Cost Estimation .....	3-3
3.2.1	Oak Ridge Environmental Management Waste Management Facility.....	3-3
3.2.2	INEEL CERCLA Disposal Facility .....	3-4
3.2.3	Fernald Onsite Disposal Facility .....	3-4
3.2.4	Weldon Spring Site.....	3-4
3.3	Historical Cost Evaluation and Presentation .....	3-5
3.3.1	Cost Evaluation Procedure .....	3-5
3.3.2	Cost Data Derived from Reviewed Reports .....	3-5

## Section 4 - Proposed Scenarios for Onsite Waste Disposal

4.1	Description of Onsite Waste Disposal Scenarios.....	4-1
4.1.1	Scenario I – Prompt D&D without Size Reduction.....	4-1
4.1.2	Scenario II – Two-Phase D&D without Size Reduction .....	4-1
4.1.3	Scenario IV – Prompt D&D with Size Reduction.....	4-2
4.1.4	Scenario VI – D&D under RCRA .....	4-2
4.1.5	Scenario VIII – Two-Phase D&D with Funding Constraints.....	4-2

## Section 5 - Conceptual Disposal Scenario Cost Estimates

5.1	Disposal Scenario Assumptions .....	5-1
5.2	Disposal Scenario Cost Summary Presentation .....	5-4
5.3	Cost Sensitivity Evaluation .....	5-5
5.3.1	Qualitative Cost Sensitivity Evaluation for a Disposal Activity .....	5-5
5.3.1.1	Capital Construction Costs .....	5-5
5.3.1.2	Disposal Facility Operational Costs .....	5-5
5.3.1.3	Closure Costs .....	5-6
5.3.1.4	Short-Term Stewardship Costs .....	5-6
5.4	Sensitivity Evaluation for Filling of Converter Voids .....	5-6
5.4.1	Cost Estimating Technique .....	5-6
5.4.2	Cost Estimating Procedure.....	5-7
Section 6 - References .....		6-1

## Appendices

<i>Appendix A - Background Information and Cost Data</i>	
<i>Appendix B - Statistical Analysis of Background Information and Cost Data</i>	
<i>Appendix C - Development of Total Cost from Escalated Unit Costs for Scenarios I, II, IV, VI, and VIII</i>	
<i>Appendix D - Derived Annual Costs for Development of Scenarios I, II, IV, VI, and VIII</i>	
<i>Appendix E - Escalation Rate Data and Discount Rate Data</i>	
<i>Appendix F - Annualized Cost Estimates for Scenario I (Current, Life-Cycle, and Present Value Costs)</i>	
<i>Appendix G - Annualized Cost Estimates for Scenario II (Current, Life-Cycle, and Present Value Costs)</i>	
<i>Appendix H - Annualized Cost Estimates for Scenario IV (Current, Life-Cycle, and Present Value Costs)</i>	
<i>Appendix I - Annualized Cost Estimates for Scenario VI (Current, Life-Cycle, and Present Value Costs)</i>	
<i>Appendix J - Annualized Cost Estimates for Scenario VIII (Current, Life-Cycle, and Present Value Costs)</i>	
<i>Appendix K - Cost Estimate for Sand and Grout Filling of Converter Voids (Current FY 2006 Cost)</i>	

# Tables

2-1	Cost Estimate Classifications
3-1	Disposal Facilities Reviewed
3-2	Disposal Facilities Used for Cost Estimation
3-3	Disposal Cost Estimate – Disposal Facilities Excluded from Cost Estimation
3-4	Historical Cost Evaluation – Disposal Facility Inventory DOE LLW at DOE and Commercial Disposal Facilities
3-5	Pre-Disposal Costs - Comparison Ranges for Commercial and DOE Disposal Facilities
3-6	Pre-Disposal Costs – DOE Onsite LLW Disposal at Hanford and Fernald Facilities
3-7	Life-Cycle Cost Data for Disposal Sites - Present Value
3-8	Life-Cycle Cost Data for Disposal Sites - Future Value
3-9	Life-Cycle Unit Costs for Disposal of DOE LLW at DOE Facilities
3-10	Disposal Cell Costs - DOE Sites
3-11	Disposal Cell Costs - Fernald OSDF Site
3-12	Onsite LLW Disposal Cost Estimate - INEEL ICDF Complex
3-13	Detailed Onsite LLW Disposal Cost Estimate - INEEL ICDF Complex
5-1	Distribution of Waste Volumes and Weights for Scenarios I, II, VI, and VIII
5-2	Distribution of Waste Volumes and Weights for Scenario IV (Size Reduction)
5-3	Disposal Activity Schedules for Scenarios I, II, IV, VI, and VIII
5-4	Estimated Cost Summary for Scenarios I, II, IV, VI, and VIII
5-5	Converter Void Volumes per Converter Type
5-6	Total Cost for Sand and Grout Filling of Converter Voids

# Acronyms

AACEI	Association for the Advancement of Cost Engineering International
CD	critical decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decommissioning
DOE	U. S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EM	environmental management
EMWMF	Environmental Management Waste Management Facility
ERDF	Environmental Restoration Disposal Facility
ETTP	East Tennessee Technology Park
FY	fiscal year
GDP	gaseous diffusion plant
ICDF	INEEL CERCLA disposal facility
INEEL	Idaho National Engineering and Environmental Laboratory
LCC	life-cycle cost
LCCA	life-cycle cost analysis
LLBG	low-level burial grounds
LLW	low-level waste
LM	legacy management
MLLW	mixed low-level waste
NTS	Nevada Test Site
OPC	other project costs
ORNL	Oak Ridge National Laboratory
OSDF	onsite disposal facility
OSWDF	onsite waste disposal facility
PORTS	Portsmouth
PT&C	Project Time and Cost, Inc.
QA/QC	quality assurance/quality control
RADF	remedial action disposal facility
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RWMC	Radioactive Waste Management Complex
SOW	scope of work
TEC	total estimated cost
TPC	total project cost
TPMC	Theta Pro2Serve Management Company, LLC
TRU	trans-uranic
TSCA	Toxic Substances Control Act
USACE	United States Army Corps of Engineers
USEC	United States Enrichment Corporation
WAC	waste acceptance criteria
WAG	waste area group
ft <sup>2</sup>	square feet
m <sup>3</sup>	cubic meters
yd <sup>3</sup>	cubic yard
\$/m <sup>3</sup>	dollar/cubic meter

# Section 1

## Introduction and Purpose

### 1.1 Introduction

This report includes a detailed discussion of the life-cycle cost estimates for onsite waste disposal scenarios at the proposed Portsmouth (PORTS) onsite waste disposal facility (OSWDF). The wastes will be produced during the PORTS gaseous diffusion plant (GDP) decontamination and decommissioning (D&D) project.

The PORTS D&D project includes the decontamination and decommissioning, and demolition of 134 facilities at the PORTS GDP near Piketon, Ohio. The 134 facilities comprise nearly 10,600,000 square feet (ft<sup>2</sup>) of floor space, which accounts for approximately 1.67 million cubic meters (m<sup>3</sup>) of low-level waste (LLW) and other types of wastes to be disposed on site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Waste includes LLW, mixed low-level waste (MLLW), Resource Conservation and Recovery Act (RCRA)-type waste, Toxic Substances Control Act (TSCA)-type waste, and sanitary wastes.

The PORTS D&D project is currently at the “Critical Decision (CD)-1, Approve Alternative Selection and Cost Range” stage. The PORTS D&D team has assembled eight scenarios for evaluation related to the D&D of the PORTS GDP. The cost estimates presented in this report are used to determine total project cost (TPC) for the long-term stewardship of an OSWDF for scenarios that evaluate onsite disposal (Scenarios I, II, IV, VI, and VIII). These costs are incorporated by the PORTS D&D team (along with D&D costs prepared by others) into a comprehensive scenario evaluation submittal (under separate cover) in support of decisions and policymaking at the CD-1 stage.

This report includes life-cycle cost analyses (LCCAs) under the five following onsite waste disposal scenarios:

1. Scenario I: Prompt D&D without size reduction
2. Scenario II: Two-phase D&D without size reduction
3. Scenario IV: Prompt D&D with size reduction
4. Scenario VI: D&D under RCRA
5. Scenario VIII: Two-phase D&D with funding constraints

These scenarios are discussed in Section 4. Cost estimates for each scenario are presented in Section 5. A separate cost estimate for the filling of converter voids using sand or grout for reducing possible subsidence in the waste disposal cell cover is also presented in Section 5.

### 1.2 Purpose

The purpose of the LCCAs is to assess the direct, indirect, recurring, nonrecurring, and other related costs incurred in the design, development, construction, operation, maintenance, and support of the project over the project’s evaluation period. LCCAs represent important economic metrics because they represent the total cost to the government and provide a sound basis for a comparison of costs anticipated to be



incurred by the government. For example, when evaluating the most cost-effective method for waste disposal, the costs for waste preparation, packaging, and transportation must be considered in addition to the disposal facility cost to understand the option that truly represents the lowest cost.

Costs for pre-disposal (preparation, packaging, and transportation costs) of wastes generated during the PORTS D&D project are not included in these cost estimates. An estimate for the pre-disposal costs is included in the cost estimate for PORTS D&D prepared by the United States Army Corps of Engineers (USACE) and Project Time and Cost, Inc. (PT&C); a general description, detailed background information of cost data, and statistical analysis of pre-disposal costs were included.

The cost estimate for post-closure/long-term stewardship is not included in these cost estimates. Post-closure/long-term stewardship responsibility will be transferred to the U. S. Department of Energy (DOE) Office of Legacy Management (LM), which manages department's post-closure responsibilities and ensure the future protection of human health and the environment. A separate cost estimate for post-closure will be submitted to DOE; however, detailed background information of cost data and statistical analysis is included in this report.

### **1.3 Report Organization**

Following is the description and organization of sections in this report:

- Section 1: This section contains the introduction and the purpose of this report.
- Section 2: This section describes the general approach used for cost evaluation and estimating during development of LCCAs presented in this report.
- Section 3: This section provides the background information and cost data used during development of LCCAs presented in this report.
- Section 4: This section presents a brief description of the proposed onsite waste disposal scenarios (Scenarios I, II, IV, VI, and VIII) that form the basis for the LCCAs.
- Section 5: This section presents the LCCAs under each scenario for the disposal of D&D waste generated during the PORTS D&D project.
- Section 6: This section provides the references used in preparation of these cost estimates.

## Section 2

# Cost Evaluation and Estimating Approach

This section provides a detailed explanation of the cost evaluation and estimating approach adopted in accordance with the *Cost Estimating Guide for Program and Project Management* (DOE April 2004). The project is at CD-1 stage. Cost estimates prepared to support the CD-1 stage will range from Class 5 - Order of Magnitude to Class 3 - Preliminary cost estimates using several cost estimating techniques. Under CD-1, the typical estimate includes TPC range for the selected alternative and LCCA. According to the DOE cost estimating guide, TPC is the cost of the performance baseline consisting of all costs included in:

- Total estimated cost (TEC)
- Other project costs (OPC), which include preconstruction costs, primary consisting of conceptual design and research and development
- Costs associated with the pre-operational phase (training and startup)
- The sum of the technical baseline, schedule baseline, and cost baseline
- Research and development, operating plant, and capital equipment costs associated with project construction

The five DOE cost estimate classifications are based on the Association for the Advancement of Cost Engineering International (AACEI) Recommended Practice for Classifying Cost Estimates (AACEI Recommended Practice No. 17R-97; Appendix J). Table 2-1 lists the cost estimating classifications.

**Table 2-1**  
**Cost Estimate Classifications**

Cost Estimate Classification	Primary Characteristics	
	Level of Definition (% of Complete Definition)	Cost Estimating Description (Techniques)
Class 5 - Order of Magnitude	0 to 2	Stochastic, most parametric, judgment (parametric, specific analogy, expert opinion, trend analysis)
Class 4 - Intermediate	1 to 15	Various, more parametric (parametric, specific analogy, expert opinion, trend analysis)
Class 3 - Preliminary	10 to 40	Various, including combinations (detailed, unit-cost, or activity-based; parametric; specific analogy; expert opinion; trend analysis)
Class 2 - Intermediate	30 to 70	Various, more definitive (detailed, unit-cost, or activity-based; expert opinion; learning curve)
Class 1 - Definitive	50 to 100	Deterministic, most definitive (detailed, unit-cost, or activity-based; expert opinion; learning curve)

Cost estimates presented in this report are classified as Class 5 according to AACEI definitions with a corresponding estimate range of -30 percent to +50 percent, based on the following:

- The annualized cost projections used for the cost estimate for onsite disposal cell activities are based on the preliminary waste generation schedule for D&D and

anticipated sequencing of onsite disposal cell activities, which are subjected to change as conceptual design for D&D and the OSWDF progresses.

- Cost estimates presented in this report were developed using parametric (top-down) and specific analogy estimating techniques.
- The historical cost sources did not provide detailed annualized cost breakdowns; therefore, the accuracy for the annualized costs presented in the estimate may be less than for the TPC.
- The level of definition for the cost estimate is very low because the cell design is still in the conceptual stage.
- Multiple site locations are still being evaluated for the onsite disposal of D&D wastes.

## 2.1 Cost Evaluation Methodology

The TPC for the onsite disposal cell is comprised of two major cost items. These cost items are further divided into cost elements or phases. The following two major cost items are discussed in detail in Sections 2.1.1 and 2.1.2:

- Pre-disposal cost of waste
- Disposal costs of waste

### 2.1.1 Pre-Disposal Costs

This section gives a description of pre-disposal cost of all the approved wastes. The pre-disposal cost is comprised of three cost elements or phases:

- Preparation
- Packaging
- Transportation

#### 2.1.1.1 Preparation

The waste samples are first analyzed by the generator to ensure that it will be certified as acceptable to the disposal facility per the site's waste acceptance criteria (WAC). This is also known as waste characterization. The generator is also responsible for treating the waste so that it is in a proper chemical and physical form to meet the disposal facility's acceptance criteria (treatment may include drying or compaction).

#### 2.1.1.2 Packaging

The generator is responsible for placing the waste (usually in the form of soil or debris) in containers or in bulk, such as a railcar. The packaging costs include the cost of the containers, the cost of placing wastes into the containers, and the cost of labeling the containers. The container type and cost vary with the characteristics of the waste.

#### 2.1.1.3 Transportation

The generator sends waste either to an onsite or offsite disposal facility, usually by trucks or rail.

## **2.1.2 Disposal Costs**

This section provides a description of cost elements (capital construction, operations, closure, and post-closure/long-term stewardship costs) and presents the estimated costs for disposal of all wastes at PORTS. Disposal costs consist of the following five cost elements or phases:

- Capital construction
- Disposal facility operational costs
- Closure costs
- Short-term stewardship
- Post-closure costs/long-term stewardship

### **2.1.2.1 Capital Construction Costs**

Capital costs primarily include engineering (design) and construction. Other costs incurred during this phase include project documentation (remedial design/remedial action [RD/RA], scope of work [SOW], design document, WAC, etc.), procurement, work authorization, quality assurance/quality control (QA/QC), and project management necessary for construction of the various facilities are included. The operating equipment and startup activities are also generally included in the capital costs.

### **2.1.2.2 Disposal Facility Operational Costs**

Disposal facility operational costs generally include the estimated number of years the facility will operate, leachate management, records management/maintenance, and project management necessary to operate the PORTS facility in compliance with the design and operational requirements.

### **2.1.2.3 Closure Costs**

Closure costs typically consist of D&D of administrative and other facilities, constructing an engineered containment barrier (cap) over the landfill cells, record management and maintenance, and project management necessary to close the facility in compliance with the design and closure requirements.

### **2.1.2.4 Short-Term Stewardship**

Short-term stewardship activities are similar to that of long-term stewardship but will be performed during the inactive periods of disposal cell operation. These include aquifer monitoring (sampling and analysis) for an estimated time period, maintenance and protection of the engineered barrier structure (cap), leachate management, and maintaining institutional controls.

### **2.1.2.5 Post-Closure Costs/Long-Term Stewardship**

Post-closure/long-term stewardship at federal facilities ensures the cleanup remedies remain effective and protective of human health and the environment after closure. These costs can include maintaining and repairing closure caps, monitoring environmental contamination, and erecting and maintaining barriers. These include aquifer monitoring (sampling and analysis) for an estimated time period, maintenance of the engineered barrier

structure (cap), leachate management, maintaining institutional controls, records management/maintenance, and project management necessary to implement these programs.

## **2.2 Cost Estimating Approach**

The PORTS D&D project is at CD-1 stage. The most appropriate estimating techniques for these Class 5 estimates are a combination of parametric or top-down and specific analogy methods.

Parametric estimating procedure produces higher-level estimates when little information, other than basic parameters, is known about a project. This type of estimate is commonly used in conceptual and check estimates. The parametric technique is best used when the design basis has evolved very little but the overall parameters have been established.

The specific analogy method is also known as “review and update technique,” where an estimate is constructed by examining previous estimates of the same or similar projects for logic, scope completion, assumptions, and other estimating techniques, and then updated to reflect any pertinent differences.

The five types of costs included in the estimates are: direct costs, indirect costs, contingency, escalation, and present value analysis. These cost types are defined in the following subsections.

### **2.2.1 Direct Costs**

Direct costs are typically identified with a particular project or activity. Direct costs may include salaries, travel, equipment, and supplies directly benefiting the project or activity.

### **2.2.2 Indirect Costs**

Indirect costs are incurred for common or joint objectives that cannot be identified with a particular activity or project.

### **2.2.3 Contingency**

Contingency is the portion of a project budget that is available for uncertainty within the project scope but outside the scope of the contract. It is the amount derived from a structured evaluation of identified risks to cover a likely future event or condition, arising from presently known or unknown causes within a defined project scope.

### **2.2.4 Escalation**

Escalation is the cost increase caused by a unit price increase. Although project cost can increase because of poor management, scope growth, and schedule delays, escalation addresses the price increase caused by an increase in the cost of labor, material, or equipment.

### **2.2.5 Present Value Analysis**

Present value analysis is a standard methodology that allows for cost comparisons of different alternatives on the basis of a single cost figure for each alternative. It is used to evaluate alternative expenditures (including capital, operations and maintenance, closure,

long-term stewardship, etc.) that occur at different times and puts them on a common basis to make a fair cost comparison of alternatives. Present value analysis requires a discounting of future dollars to reflect the time value of money. In other words, it is based on a dollar being worth more today than in the future because of potential returns that the dollar could earn if invested in alternate ways. In this manner, present value discounting reflects the potential productivity inherent in well deployed capital.

*This Page was Intentionally Left Blank*

## Section 3

# Background Information and Cost Data

This section discusses the reports used to collect the historical unit cost data from various disposal facilities. A brief discussion and description of all the facilities discussed in these reports that were used for estimating costs for the PORTS D&D waste disposal project is also included. All the data collected from various facilities are tabulated in this section.

### 3.1 Background Reports

Data reviewed for this report were obtained from various onsite/offsite, CERCLA/non-CERCLA, and DOE/commercial disposal facilities throughout the United States. Life-cycle cost (LCC) data were collected from the following disposal facilities:

**Table 3-1**  
**Disposal Facilities Reviewed**

<b>DOE CERCLA Disposal Facilities</b>	<b>DOE Non-CERCLA Disposal Facilities</b>	<b>Commercial Disposal Facilities</b>
Hanford ERDF	Savannah River Site Trenches	Envirocare (soil & debris)
Oak Ridge EMWMF	Savannah River Site Vaults	Barnwell
INEEL ICDF	Nevada Test Site	US Ecology
Fernald OSDF	INEEL RWMC	
Weldon Spring Site RADF	Hanford LLBG	

**EMWMF** - Environmental Management Waste Management Facility, **ERDF** - Environmental Restoration Disposal Facility, **ICDF** - INEEL CERCLA Disposal Facility, **INEEL** - Idaho National Engineering and Environmental Laboratory, **LLBG** - Low-Level Burial Grounds, **OSDF** - Onsite Disposal Facility, **RADF** - Remedial Action Disposal Facility, **RWMC** - Radioactive Waste Management Complex

The following reports were used to obtain historic unit pre-disposal and disposal costs:

- *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*, March 2002, U. S. Department of Energy, Office of Environmental Management
- *Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH*, June 2002, U. S. Department of Energy, Office of Environmental Management
- *On-Site Disposal Facility (OSDF) Interim Remedial Action Report for Operable Unit 5 - January 2005 (Draft)*, Fernald Closure Project
- *Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison*, EDF-2385, February 2003, Idaho National Engineering and Environmental Laboratory

The following guidance and other informational documents were used to prepare this estimate:

- *Cost Estimating Guide for Program and Project Management*, DOE G 430.1-1X, April 2004, U. S. Department of Energy, Office of Management, Budget and Evaluation



- *Cost Estimating Guide*, DOE G 430.1-1, 03-28-97, U. S. Department of Energy, Associate Deputy Secretary for Field Management
- *Department of Energy, Improved Guidance, Oversight, and Planning Are Needed to Better Identify Cost-Saving Alternatives for Managing Low-Level Radioactive Waste*, October 2005, United States General Accounting Office
- *Low-Level Radioactive Wastes, Department of Energy Has Opportunities to Reduce Disposal Costs*, April 2000, United States General Accounting Office
- *The Current and Planned Low-Level Waste Disposal Capacity Report, Revision 2*, December 2000, U. S. Department of Energy, Office of Environmental Management
- *DOE 2006a - Cost Engineering Group web site*  
 <<http://oecm.energy.gov/Default.aspx?tabid=263>>
- *DOE 2006b - U. S. Department of Energy, Office of Environmental Management's web site (Fernald On-Site Disposal Facility, Hanford Environmental Restoration Disposal Facility, INEEL CERCLA Disposal Facility, Oak Ridge Environmental Management Waste Management Facility)* – <<http://web.em.doe.gov/profiles/>>

Table 3-2 summarizes the disposal facilities that were considered for estimating the final disposal cost estimate for onsite waste disposal at PORTS.

**Table 3-2**  
**Disposal Facilities Used for Cost Estimation**

Facilities Used for Estimating Disposal Cost
Fernald OSDF
INEEL ICDF
Oak Ridge EMWMF
Weldon Spring

**EMWMF** - Environmental Management Waste Management Facility,  
**ICDF** - INEEL CERCLA Disposal Facility, **INEEL** - Idaho National  
 Engineering and Environmental Laboratory, **LLBG** - Low-Level Burial  
 Grounds, **OSDF** - On-Site Disposal Facility

Data from the other disposal facilities were not considered because of the dissimilarities between the scope of the proposed PORTS OSWDF and the scope of other disposal facilities. Table 3-3 lists disposal facilities and reasons for excluding them from the cost estimate. The cost data derived from these facilities are tabulated for statistical analysis of costs and are presented in Appendix A.

**Table 3-3  
Disposal Cost Estimate**

**Disposal Facilities Excluded from Cost Estimation**

Disposal Facilities	Reasons for Excluding from Cost Estimation
Hanford ERDF	1. Cost elements under disposal were too low as compared to disposal costs at other facilities, which would have affected the statistical analysis of escalated costs.
Hanford LLBG	1. Hanford LLBG is a non-CERCLA facility and accepts LLW from other offsite facilities, which is beyond the scope of the proposed LLW disposal facility at PORTS. 2. The disposal costs are too high in comparison to other sites.
Savannah River Site Trenches	1. Savannah River site is a non-CERCLA facility and accepts LLW and higher activity MLLW from other offsite facilities, which is beyond the scope of the proposed LLW disposal facility at PORTS. 2. The disposal costs are too high in comparison to other sites.
Savannah River Site Vaults	
Nevada Test Site	1. NTS is a non-CERCLA facility and accepts LLW and higher activity MLLW from other offsite facilities, which is beyond the scope of the proposed LLW disposal facility at PORTS. 2. The disposal costs are high in comparison to other sites.
INEEL RWMC	1. INEEL RWMC is a non-CERCLA facility which is beyond the scope of the proposed LLW disposal facility at PORTS. 2. The disposal costs are high in comparison to other sites.
Envirocare (Soil & Debris)	1. Envirocare, Barnwell, and US Ecology are commercial disposal facilities for LLW and higher activity MLLW.
Barnwell	
US Ecology	

**ERDF** - Environmental Restoration Disposal Facility, **INEEL** - Idaho National Engineering and Environmental Laboratory, **LLBG** - Low-Level Burial Grounds, **NTS** - Nevada Test Site, **RWMC** - Radioactive Waste Management Complex

## 3.2 Disposal Facilities Used for the Cost Estimation

This section includes a brief discussion and description of all the facilities that were used for estimating total disposal cost for the PORTS D&D project. All the discussions presented below are based on *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*, March 2002, U. S. Department of Energy, Office of Environmental Management.

### 3.2.1 Oak Ridge Environmental Management Waste Management Facility

The Oak Ridge onsite CERCLA disposal facility, the Environmental Management Waste Management Facility (EMWMF) began operating in fiscal year (FY) 2002. The EMWMF accepts waste from Oak Ridge Reservation CERCLA remedial actions only. The waste consists primarily of soil and debris as LLW, MLLW, and hazardous waste. Sources of debris are building D&D at the East Tennessee Technology Park (ETTP) and building and reactor D&D at Oak Ridge National Laboratory (ORNL). Approximately 30 percent of the wastes at the Oak Ridge Reservation are expected to require treatment to immobilize hazardous contaminants in soil and debris waste streams and to remove liquids from sludge waste streams to meet land disposal restrictions. Wastes are delivered to the facility unpackaged in lined dump trucks, in roll-off boxes, or in sacrificial containers (drums or B-25 boxes). A total of 1.3 million m<sup>3</sup> is projected to be disposed in the facility.

The EMWMF is being built in increments of 400,000 cubic yards (yd<sup>3</sup>). After each 400,000 yd<sup>3</sup> cell is filled, a cap is placed over it. After all cells are completed, one large contiguous cap will

be installed to cover everything. Plans call for EMWMF to operate through FY 2010. Closure was started in FY 2005, when the first 400,000 yd<sup>3</sup> cell was filled. Per agreement with the State of Tennessee, long-term stewardship costs will be funded early in the program, with the funds placed into a Perpetual Care Fund that will be managed by the state.

### **3.2.2 INEEL CERCLA Disposal Facility**

INEEL has an onsite CERCLA disposal facility - INEEL CERCLA Disposal Facility (ICDF). This facility is located at the Idaho Nuclear Technology and Engineering Center, which, for CERCLA purposes, is designated as Waste Area Group (WAG) 3. The ICDF began its operations in FY 2003. Based on current projections, approximately 28 percent of the ICDF waste will come from sources outside WAG 3. ICDF handles both LLW and MLLW wastes. The plan for the facility is to operate through FY 2012, followed by closure and 100 years of long-term stewardship. A total of 320,000 m<sup>3</sup> is projected to be disposed in the facility.

### **3.2.3 Fernald Onsite Disposal Facility**

The Fernald CERCLA OSDF is located on the east side of the former production area at the 1,050 acre Fernald site. The footprint used for waste disposal is approximately 70 acres, with a total facility area of 140 acres including the buffer zone. The OSDF receives LLW, primarily as soils with some debris. The facility receives waste from Fernald only. The WAC were developed to protect the underlying Great Miami Aquifer and include maximum concentration limits on specific radionuclides and chemicals, size criteria, and a list of prohibited items. Waste not meeting the WAC for the OSDF is sent offsite to the Nevada Test Site (NTS) and Envirocare (Fernald has found bulk shipments to Envirocare to be cost-effective, mainly because shipments are sent by rail).

The Fernald OSDF began operation in FY 1998 and has disposed of 510,000 m<sup>3</sup> of waste through FY 2001. An additional 1.4 million m<sup>3</sup> are projected to be disposed of from FY 2002 through FY 2006. Disposal operations are projected to continue through FY 2006, followed by closure and 100 years of long-term stewardship.

### **3.2.4 Weldon Spring Site**

The Weldon Spring Site is located approximately 10 miles west of the St. Louis, Missouri area. The Weldon Spring Site Remedial Action Disposal Facility is located in the northeastern portion of the 226-acre Chemical Plant Site. The footprint to be used for waste disposal is approximately 40 acres, with a total facility area of 70 acres including the buffer zone. The key factors in reaching the decision to construct this disposal facility were ease of implementation, short-term effectiveness, and cost. The total estimated volume to be disposed in the facility is 1,100,000 m<sup>3</sup>.

The contaminated materials are in the form of soils, bulk wastes from the associated quarry site, sludge, debris, and components of disassembled chemical plant structures. The sludge produced during uranium refinement is being treated to remove chemical contaminants. Further treatment in the Chemical Stabilization/Solidification Plant will prepare them for placement in the permanent disposal facility. The primary contaminants are thorium-230 and uranium.

### 3.3 Historical Cost Evaluation and Presentation

This section presents all the historical costs and a detailed procedure used to evaluate the unit costs for disposal activities.

#### 3.3.1 Cost Evaluation Procedure

The following method and assumptions were used to evaluate and estimate the unit LCC and the total cost for the disposal cost elements:

- All the data derived from the reports discussed in Section 3.1 were tabulated for statistical analysis of costs and are presented in Appendix A (Tables A1 through A4). Data were arranged for each disposal site to present unit quantity of waste disposed in m<sup>3</sup>, unit price in dollar/cubic meter (\$/m<sup>3</sup>), total price in dollars (\$), and date of the estimate as mentioned in the respective report from which the data was derived.
- The unit price in \$/m<sup>3</sup> or total price in \$ were calculated based on the quantity of waste disposed in the respective disposal facilities to fill in the missing data.
- Unit prices for all the cost elements and facilities were escalated to the FY 2006 dollar value (that is, unit prices for disposal estimated in FY 2002 were escalated to represent the current dollar value for second quarter of the FY 2006).
- Escalation of costs was conducted using escalation indices provided by DOE's Cost Engineering Group web site (DOE 2006a). Indices from two different tables were used (presented in Appendix B, Tables B5 and B6) to escalate the costs to the current 2006 dollar value. Costs estimated before FY 2002 were escalated to FY 2002 using escalation indices from the *January 2001 Update* table. Costs were then escalated from FY 2002 to FY 2006 using escalation indices from the *January 2004* table. Escalated costs are presented in Appendix B, Tables B1 through B4.
- Statistical analysis of escalated costs was completed for those disposal facilities that represented a similar scope (e.g., amount of waste, type of waste, type of disposal, regulations regarding waste disposal) for disposal of LLW/MLLW.

#### 3.3.2 Cost Data Derived from Reviewed Reports

Cost data for pre-disposal and disposal of approved wastes were derived from the reports listed in Section 3.1 and are presented in the following tables.

Tables 3-4 to 3-9 are derived from *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*, March 2002, U. S. Department of Energy, Office of Environmental Management.

Table 3-10 is derived from *Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH*, June 2002, U. S. Department of Energy, Office of Environmental Management.

Table 3-11 is derived from *On-Site Disposal Facility (OSDF) Interim Remedial Action Report for Operable Unit 5 - January 2005 (Draft)*, Fernald Closure Project.

Tables 3-12 and 3-13 are derived from *Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison*, EDF-2385, February 2003, Idaho National Engineering and Environmental Laboratory.

Table 3-4  
 Historical Cost Evaluation - Disposal Facility Inventory  
 DOE LLW at DOE and Commercial Disposal Facilities

Sites/Disposal Facilities	Onsite Facility	Offsite Facility	Accepts Waste From		CERCLA	Non-CERCLA	Waste Category	
			Onsite Facility	Multiple Facility			LLW	MLLW
Hanford ERDF	✓		✓		✓		✓	< 1%
Oak Ridge EMWMF	✓		✓		✓		✓	✓
INEEL ICDF	✓		✓	✓	✓		✓	✓
Fernald OSDF	✓		✓		✓		✓	

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, **DOE** - U.S. Department of Energy, **EMWMF** - Environmental Management Waste Management Facility, **ERDF** - Environmental Restoration Disposal Facility, **ICDF** - INEEL CERCLA Disposal Facility, **INEEL** - Idaho National Engineering and Environmental Laboratory, **LLW** - Low-Level Radioactive Waste, **MLLW** - Mixed Low-Level Radioactive Waste, **OSDF** - On-Site Disposal Facility

**Source:** 1. *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*, March 2002, U.S. Department of Energy, Office of Environmental Management. 2. <http://web.em.doe.gov/profiles/>

Table 3-5

Pre-Disposal Costs

Comparison Ranges for Commercial and DOE Disposal Facilities

Pre-Disposal Stages	Sites/Disposal Facilities <sup>1</sup>	
	Envirocare	DOE <sup>2</sup>
Preparation (\$/m <sup>3</sup> )	\$71 - \$1,200	\$5 - \$6,700
Packaging (\$/m <sup>3</sup> )	\$88 - \$1,000	\$0 - \$2,000
Transportation (\$/m <sup>3</sup> )	\$84 - \$420	\$25 - \$6,000

DOE - U.S. Department of Energy, m<sup>3</sup> - Cubic Meter

**Source:** *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.*

**Note:**

1. Pre-disposal costs associated with onsite CERCLA disposal are much lower than for other disposal facilities because of the low costs associated with bulk landfill disposal, as well as the very large waste volumes involved.
2. DOE facilities includes NTS, Hanford LLBG, Hanford ERDF, Savannah River Site Trenches Idaho, and Fernald OSDF

Table 3-6

Pre-Disposal Costs

DOE Onsite LLW Disposal at Hanford and Fernald Facilities

Pre-Disposal Stages	Sites/Disposal Facilities	
	Fernald	
Preparation (\$/m <sup>3</sup> )	\$137	
Packaging (\$/m <sup>3</sup> )	\$16	
Transportation (\$/m <sup>3</sup> )	\$73	

DOE - U.S. Department of Energy, LLW - Low-Level Radioactive Waste, m<sup>3</sup> - Cubic Meter

**Source:** *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.*

Table 3-7  
Life-Cycle Cost Data for Disposal Sites - Present Value

Sites/Disposal Facilities		Projected LLW Disposal Volumes (m <sup>3</sup> )	Capital Construction (\$)	Disposal Facility Operation (\$)	Closure (\$)	Long-Term Stewardship (\$)	Total Life-Cycle Cost - Present Value(\$)
DOE CERCLA Disposal Facilities	Oak Ridge EMWMF <sup>1</sup>	1,154,275	\$77,273,000	\$56,109,000	\$39,417,000	\$8,714,000	\$181,513,000
	INEEL ICDF	289,841	\$20,269,000	\$16,665,000	\$6,439,000	\$5,967,000	\$49,340,000
	Fernald OSDF <sup>2</sup>	1,306,526	\$82,442,000	\$90,995,000	\$25,624,000	\$61,020,000	\$260,081,000

DOE - U.S. Department of Energy, m<sup>3</sup> - Cubic Meter, OSDF - Onsite Disposal Facility

Table 3-8  
Life-Cycle Cost Data for Disposal Sites - Future Value

Sites/Disposal Facilities		Projected LLW Disposal Volumes (m <sup>3</sup> )	Capital Construction (\$)	Disposal Facility Operation (\$)	Closure (\$)	Long-Term Stewardship (\$)	Total Life-Cycle Cost - Future Value(\$)
DOE CERCLA Disposal Facilities	Oak Ridge EMWMF <sup>1</sup>	1,310,368	\$86,231,000	\$63,354,000	\$48,474,000	\$10,000,000	\$208,059,000
	INEEL ICDF	316,453	\$20,453,000	\$19,364,000	\$9,105,000	\$12,333,000	\$61,255,000
	Fernald OSDF <sup>2</sup>	1,387,693	\$88,850,000	\$97,650,000	\$27,500,000	\$205,284,000	\$419,284,000

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLW - Low-Level Radioactive Waste, m<sup>3</sup> - Cubic Meter, OSDF - On-Site Disposal Facility

**Source:** Appendix B - The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.

**Note:**

1. Long-term stewardship costs for Oak Ridge EMWMF reflect funding of a Perpetual Care Fund managed by the State of Tennessee.
2. Fernald OSDF provided a long-term stewardship cost estimate for the entire site, which includes activities other than LTS for the OSDF. Therefore, this probably overestimates the LTS cost associated with the OSDF.



**Table 3-9**  
**Life-Cycle Unit Costs**

for Disposal of DOE LLW at DOE Facilities

Sites/Disposal Facilities		Life-Cycle Unit Cost (\$/m <sup>3</sup> )	
		Present Value (FY 2002)	Life-Cycle
<b>DOE CERCLA Disposal Facilities</b>	Oak Ridge EMWMF	\$140	\$160
	INEEL ICDF	\$160	\$194
	Fernald OSDF	\$190	\$302

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, **DOE** - U.S. Department of Energy, **EMWMF** - Environmental Management Waste Management Facility, **ICDF** - INEEL CERCLA Disposal Facility, **INEEL** - Idaho National Engineering and Environmental Laboratory, **LLW** - Low-Level Radioactive Waste, **m<sup>3</sup>** - Cubic Meter, **OSDF** - On-Site Disposal Facility

**Source:** Table 3.2 & Appendix B - *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*, March 2002, U.S. Department of Energy, Office of Environmental Management.

**Note:**

1. The unit cost of DOE disposal facilities was calculated as the present value/future value divided by the total waste volume to be disposed of in the facility.
2. These costs do not include surcharge for remote handling, shielding, MLLW, etc.
3. Cost estimates for DOE facilities include all future closure and long-term stewardship costs even though, for many of the facilities, these are partially sunk costs that DOE must pay regardless of whether any future waste is emplaced in the facility.

Table 3-10  
 Disposal Cell Costs - DOE Sites

Sites/Disposal Facilities	Capital Construction Cost (\$/m <sup>3</sup> )	Disposal Facility Operation Cost (\$/m <sup>3</sup> )	Closure Cost (\$/m <sup>3</sup> )	Long-Term Stewardship Cost (\$/m <sup>3</sup> )	Total Disposal Cell Cost (\$/m <sup>3</sup> )
Oak Ridge <sup>1</sup>	\$61	\$61	\$26	\$32	\$180
Fernald OSDF <sup>2</sup>	\$84	\$16	\$22	\$13	\$135
Weldon Spring <sup>3</sup>	\$97	\$12	\$9	\$42	\$160

DOE - U.S. Department of Energy, m<sup>3</sup> - Cubic Meter, OSDF - Onsite Disposal Facility

**Source:** Table 2 - Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. Department of Energy, Office of Environmental Management.

**Note:**

1. Volume predicted for disposal - 400,000 to 1,700,000 (cubic yard) CY
2. Volume predicted for disposal - 2,500,000 CY
3. Volume predicted for disposal - 1,500,000 CY

**Table 3-11**  
**Disposal Cell Costs - Fernald OSDF Site**

FCP OSDF Cells	In-Place Volume (m <sup>3</sup> )	Year of Estimate	Percent Complete	ROD Final Cover, Liner, & Placement Estimated Cost	Total Actual Cost		Total Actual Cost
					Construction	Engineering	
<b>Cell No. 1</b>	240,287	2000	100%	\$107,390,000	\$16,362,000	\$5,500,000	\$21,862,000
<b>Cell No. 2</b>	288,345	2002	100%	\$107,390,000	\$23,127,000	\$7,774,000	\$30,901,000
<b>Cell No. 3</b>	284,287	2004	100%	\$107,390,000	\$21,402,000	\$7,194,000	\$28,596,000

FCP - Fernald Closure Project, m<sup>3</sup> - Cubic Meter, OSDF - Onsite Disposal Facility, ROD - Record of Decision

Source: Table 3-1 & Attachment 1, OSDF Interim Remedial Action Report for Operable Unit 5 - January 2005 (Draft), Fernald Closure Project

Table 3-12  
Onsite LLW Disposal Cost Estimate - INEEL ICDF Complex

Cost Element	Cost Estimate (2002)
Design/Construction/Startup Total	\$46,852,000
Operations Total (10 years and 510,000 yd <sup>3</sup> )	\$15,388,000
Closure Total	\$18,699,000
Post Closure Total	\$5,665,000
<b>Grand Total</b>	<b>\$86,604,000</b>

Table 3-13  
Detailed Onsite LLW Disposal Cost Estimate - INEEL ICDF Complex

Item	Cost
<b>ICDF Complex Project (Design/Build/Startup)</b>	<b>\$46,852,000</b>
ICDF Design	\$8,010,000
SSSTF Design	\$4,211,000
Remedial Action Work Plan	\$917,000
ICDF Complex Startup (SSSTF, Cell 1 and 2)	\$3,970,000
ICDF Complex Fleet Equipment	\$2,278,000
ICDF Complex Construction	\$21,472,000
Program/Project Management	\$5,996,000
<b>ICDF Complex Operation (For 510,000 yd<sup>3</sup>)</b>	<b>\$15,388,000</b>
Waste Characterization	\$4,250,000
Treatment and Disposal Operations	\$5,321,000
Records Management	\$1,173,000
Surveillance and Monitoring	\$2,675,000
Maintenance	\$1,087,000
Program/Project Management	\$882,000
<b>ICDF Complex Closure</b>	<b>\$18,699,000</b>
Deactivation and Characterization	\$15,841,000
Evaporation Pond Closure	\$781,000
Records Management	\$75,000
Surveillance and Monitoring	\$186,000
Maintenance	\$51,000
Program/Project Management	\$1,765,000
<b>ICDF Complex Post Closure (Through 2095)</b>	<b>\$5,665,000</b>
Records Management	\$1,040,000
Surveillance and Monitoring	\$3,177,000
Maintenance	\$751,000
Program/Project Management	\$696,000

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, **ICDF** - INEEL CERCLA Disposal Facility, **INEEL** - Idaho National Engineering and Environmental Laboratory, **LLW** - Low-Level Radioactive Waste, **m<sup>3</sup>** - Cubic Meter, **OSDF** - On-Site Disposal Facility, **SSSTF** - Staging, Storage, Sizing, and Treatment Facility, **yd<sup>3</sup>** - Cubic Yard

**Source:** Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, Idaho National Engineering and Environmental Laboratory

*This Page was Intentionally Left Blank*

## Section 4

# Proposed Scenarios for Onsite Waste Disposal

Waste disposal for onsite scenarios are presented and discussed in this section. There are eight scenarios; five are proposed to have onsite disposal facility, and three are proposed to have offsite disposal. In this report, only onsite disposal Scenarios I, II, IV, VI, and VIII are discussed. Cost estimates for offsite Scenarios III and V and Scenario VII are provided in a separate report by Theta Pro2Serve Management Company, LLC (TPMC). The scenarios are as follows:

- Scenario I: Prompt D&D without size reduction
- Scenario II: Two-Phase D&D without size reduction
- Scenario III: Offsite disposal without size reduction
- Scenario IV: Prompt D&D with size reduction
- Scenario V: Offsite disposal with size reduction
- Scenario VI: D&D under RCRA
- Scenario VII: Surveillance and maintenance (no wastes are generated)
- Scenario VIII: Two-phase D&D with funding constraints

### 4.1 Description of Onsite Waste Disposal Scenarios

All onsite disposal scenarios (I, II, IV, VI, and VIII) include the disposal of all waste, except trans-uranic (TRU) and liquid, into the OSWDF. The waste acceptance criteria for the OSWDF is assumed to include RCRA wastes, classified wastes, sanitary wastes, mixed low-level radioactive waste, low-level radioactive waste, asbestos, and TSCA wastes.

#### 4.1.1 Scenario I – Prompt D&D without Size Reduction

The facilities at PORTS will be returned to DOE by the United States Enrichment Corporation (USEC) at the end of the USEC lease. DOE will commence prompt D&D after the return of the facilities. The facilities and components will not be reduced in size for disposal or transportation; grout, foam, or sand will be used for void reduction during disposal. All approved wastes generated during the D&D project will be disposed in the OSWDF. TRU and liquid wastes will be packaged and shipped to an approved offsite disposal facility.

#### 4.1.2 Scenario II – Two-Phase D&D without Size Reduction

The facilities at PORTS will be returned to DOE by USEC at the end of the USEC lease, with the exception of those subject to the USEC lease extension. USEC will extend the lease of certain facilities in support of the Advanced Centrifuge Project until 2027. In 2027, USEC has the option of extending this lease another 20 years until 2047. DOE will commence prompt D&D after the return of the facilities. The facilities and components will not be reduced in size for disposal or transportation; grout, foam, or sand will be used for void reduction during disposal. All approved wastes generated during the D&D project will be disposed in the OSWDF. TRU and liquid wastes will be packaged and shipped to an approved offsite disposal facility.

### **4.1.3 Scenario IV – Prompt D&D with Size Reduction**

The facilities at PORTS will be returned to DOE by USEC at the end of the USEC lease. DOE will commence prompt D&D after the return of the facilities. The facilities and components will be size-reduced for disposal. All approved wastes generated during the D&D project will be disposed in the OSWDF. TRU and liquid wastes will be packaged and shipped to an approved offsite disposal facility.

### **4.1.4 Scenario VI – D&D under RCRA**

The facilities at PORTS will be returned to DOE by USEC at the end of the USEC lease. DOE will commence prompt D&D after the return of the facilities. The facilities and components will not be reduced in size for disposal or transportation; grout, foam, or sand will be used for void reduction during disposal. All approved wastes generated during the D&D project will be disposed in the OSWDF. The OSWDF will be permitted and regulated under RCRA instead of CERCLA. TRU and liquid wastes will be packaged and shipped to an approved offsite disposal facility.

### **4.1.5 Scenario VIII – Two-Phase D&D with Funding Constraints**

The facilities at PORTS will be returned to DOE by USEC at the end of the USEC lease. DOE will commence prompt D&D after the return of the facilities. The facilities and components will not be reduced in size for disposal or transportation; grout, foam, or sand will be used for void reduction during disposal. All approved wastes generated during the D&D project will be disposed in the OSWDF in two phases and with limited funding. TRU and liquid wastes will be packaged and shipped to an approved offsite disposal facility.

# Section 5

## Conceptual Disposal Scenario Cost Estimates

This section presents the disposal scenario assumptions and the conceptual disposal scenario cost estimate summaries prepared for the disposal of D&D waste generated during the PORTS D&D project.

### 5.1 Disposal Scenario Assumptions

The following methods and assumptions were used to prepare the cost estimate summaries for disposal Scenarios I, II, IV, VI, and VIII:

- A statistical analysis of the escalated unit costs (for disposal costs only) of selected disposal facilities was completed to create a range of unit cost values in the form of expected minimum, expected average, and expected high unit costs in \$/m<sup>3</sup>. These costs are presented in Table C1, Appendix C.
- Expected high unit costs were used to calculate the cost for each disposal activity cost. High unit costs (Table C1) were used because these unit costs were obtained from Fernald OSDF; INEEL ICDF; Oak Ridge EMWMF; and Weldon Spring disposal facilities, which had significantly less duration for landfill construction, operation, and closure (ranging from 5 years to 9 years) as opposed to longer durations (ranging from 9 years to 26 years) for all five scenarios (I, II, IV, VI, and VIII). The expected high costs were typically derived from Fernald OSDF, which had a similar disposal scope to the proposed PORTS OSWDF and is also located in Ohio.
- Based on the selected unit costs, annual costs for each disposal activity for all scenarios were calculated using estimated disposal volumes. Disposal waste volume of 1,667,546 m<sup>3</sup> was used for Scenarios I, II, VI, and VIII, and a reduced volume of 1,587,676 m<sup>3</sup> was used for Scenario IV. The distribution of waste volumes and weights used to develop the annual costs is presented in Tables 5-1 and 5-2. Total costs for disposal activities for each scenario are presented in Tables C2 and C3, Appendix C.

**Table 5-1**  
**Distribution of**  
**Waste Volumes and Weights for Scenarios I, II, VI, and VIII**

<i>Waste Type</i>	<i>Volume (m<sup>3</sup>)</i>	<i>Weight (Tons)</i>
Low Level	1,167,030	2,597,033
Low Level Mixed	39,383	79,563
RCRA	154	629
TSCA	8,314	14,244
Sanitary	452,666	994,346
<b>TOTAL</b>	<b>1,667,546</b>	<b>3,685,814</b>

**RCRA** - Resource Conservation and Recovery Act, **TSCA** - Toxic Substances Control Act  
**Source:** Draft Final, Cost and Schedule Summary Report, Scenarios I – VI, June 30<sup>th</sup>, 2006,  
 U. S. Department of Energy Portsmouth Gaseous Diffusion Plant, Piketon, Ohio



**Table 5-2**  
**Distribution of**  
**Waste Volumes and Weights for Scenario IV (Size Reduction)**

<b>Waste Type</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Weight (Tons)</b>
Low Level	1,087,160	2,597,204
Low Level Mixed	39,383	79,563
RCRA	154	629
TSCA	8,314	14,244
Sanitary	452,666	994,346
<b>TOTAL</b>	<b>1,587,676</b>	<b>3,685,985</b>

**RCRA** - Resource Conservation and Recovery Act, **TSCA** - Toxic Substances Control Act  
**Source:** Draft Final, Cost and Schedule Summary Report, Scenarios I – VI, June 30<sup>th</sup>, 2006,  
U. S. Department of Energy Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

- Total cost for each disposal activity obtained from Tables C2 and C3 was spread over the disposal schedule to develop an annualized cost projection for each disposal activity within each scenario.
- Based on the waste generation schedule for D&D and anticipated sequencing of OSWDF activities, disposal activity schedules for Scenarios I, II, IV, VI, and VIII were developed and are presented in Table 5-3.
- The following assumptions are common to the calculation of annual costs for Scenarios I, II, IV, VI, and VIII:
  - **Design Costs (Engineering Evaluation/Cost Analysis [EE/CA] and Cell Design):** Design cost is assumed to be 15 percent of the total capital construction cost of which 20 percent of the cost is assumed for EE/CA and 80 percent of the cost is assumed for OSWDF design.
  - **Capital Construction Cost:** Capital construction cost is assumed to be 80 percent of the total capital construction cost. The first 2 years of annual construction cost is doubled (incremental funding) to accommodate the required initial infrastructure costs (including cell construction, parking, lighting, fencing, etc.) and the initial regulatory requirements.
  - **Disposal Facility Operational Cost:** Annual operational cost for the years discussed in Table 5-3 before the start of the closure is 1.5 times the annual cost (incremental funding) to accommodate relatively heavy initial operations due to stockpiling of wastes and high amount of leachate management in the absence of engineered cap/cover.
  - **Closure Cost:** Annual closure cost is doubled (incremental funding) for the last 2 years to accommodate the cost for placing the final landfill engineered cap/cover and the regulatory requirements at the end of the closure process.
- The following additional assumptions were made specifically for Scenarios II and VIII:
  - **Short-Term Stewardship:** In the absence of historical costs and similar activities involved for short-term stewardship, annual cost for long-term stewardship is used.

**Table 5-3**  
**Disposal Activity Schedules for Scenarios I, II, IV, VI, and VIII**

Disposal Scenario	Disposal Activities and Schedule											
	Design				Capital Construction		Operation		Closure		Short-Term Stewardship	
	EE/CA Schedule	Years	OSWDF Design Schedule	Years	Schedule	Years	Schedule	Years	Schedule	Years	Schedule	Years
I	FY2007	1	FY2007 to FY2008	2	FY2009 to FY2017	9	FY2011 to FY2025	15	FY2015 to FY2026	12		
II	FY2007	1	FY2007 to FY2008	2	FY2009 to FY2017	9	FY2011 to FY2024 and FY2039 to FY2043	19	FY2015 to FY2024 and FY2043 to FY2044	12	FY2025 to FY2038	14
IV	FY2007	1	FY2007 to FY2008	2	FY2009 to FY2017	9	FY2011 to FY2024	14	FY2015 to FY2025	11		
VI	FY2007	1	FY2007 to FY2008	2	FY2009 to FY2017	9	FY2011 to FY2025	15	FY2015 to FY2026	12		
VIII	FY2007 to FY2008	2	FY2009 to FY2011	3	FY2012 to FY2029	18	FY2014 to FY2018 and FY2020 to FY2035 and FY2038 to FY2042	26	FY2022 to FY2043	22	FY2019 and FY2036 to FY2037	3

The calculation for annual costs for Scenarios I, II, IV, VI, and VIII are presented in Tables D1 through Table D5, Appendix D.

- Annual costs for each disposal scenario activity were calculated based on the preliminary waste generation schedule for D&D and anticipated sequencing of OSWDF activities, which are subject to change.

Based on the annual costs obtained for each disposal activity for each scenario (Table D1 through D5, Appendix D), an annualized cost estimate was prepared for each scenario and is presented in the following appendices:

- Appendix F – Scenario I Cost Estimate
  - Appendix G – Scenario II Cost Estimate
  - Appendix H – Scenario IV Cost Estimate
  - Appendix I – Scenario VI Cost Estimate
  - Appendix J – Scenario VIII Cost Estimate
- The annualized cost estimate for each disposal scenario has three sections; current (FY 2006) costs in dollars, life-cycle costs in dollars, and present value costs in dollars.
    - **Current (FY 2006) cost estimate:** The current (FY 2006) cost presents the FY 2006 cost worth of the future cost (i.e., costs without escalation). Contingency of 20 percent is added to the total annual cost per annualized basis.
    - **Life-cycle cost estimate:** All the current costs were escalated for the respective year using escalation index based on a constant rate of 2.4 percent after FY 2008. This constant rate of 2.4 percent was obtained from *Escalation Rate Assumptions for DOE Projects (January 2004)*, under Environmental Management (EM) Project Category and is presented in Appendix E, Table E1. Contingency of 20 percent is added to the total annual cost per annualized basis.
    - **Present value analysis:** Present value analysis was done based on the 5.2 percent discount rate provided by DOE (*Appendix C, Revised January 2006, OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specified Maturities*) and is presented in Appendix E, Tables E2 and E3.

## 5.2 Disposal Scenario Cost Summary Presentation

The cost estimate details are presented in Appendices F through J. The cost estimates presented in Table 5-4 were used to determine TPC for the design, construction, operation, and closure of an OSWDF for scenarios that evaluate onsite disposal (Scenarios I, II, IV, VI, and VIII). These costs were incorporated by TPMC (along with D&D costs prepared by PT&C) into a comprehensive scenario evaluation submittal (under separate cover) in support of decisions and policymaking at the CD-1 stage.

**Table 5-4**  
**Estimated Cost Summary for Scenarios I, II, IV, VI, and VIII**

Scenario	Cost Type		
	TPC (Current Dollars)	TPC (Life-Cycle Dollars)	TPC (Present Value Dollars)
Scenario I (Prompt D&D)	\$472,252,000	\$593,588,000	\$373,672,000
Scenario II (Two-Phase D&D)	\$517,917,000	\$732,918,000	\$379,729,000
Scenario IV (Prompt D&D with Size Reduction)	\$449,637,000	\$561,331,000	\$357,770,000
Scenario VI (Prompt D&D Under RCRA)	\$472,252,000	\$593,588,000	\$373,672,000
Scenario VIII (Two-Phase D&D with Funding Constraints)	\$482,046,000	\$755,514,000	\$310,103,000

TPC - Total project cost, RCRA - Resource Conservation and Recovery Act, D&D - Decontamination and Decommissioning

## 5.3 Cost Sensitivity Evaluation

A cost sensitivity evaluation can determine which disposal activities drive the TPC. This section presents a qualitative cost sensitivity evaluation for the annualized cost projection and sensitivity evaluation for filling converter voids.

### 5.3.1 Qualitative Cost Sensitivity Evaluation for a Disposal Activity

The qualitative cost sensitivity evaluation for all disposal activities include capital construction, disposal facility operation, closure, short-term stewardship costs, and the inter-dependability of various factors that might affect the total disposal activity cost.

The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the D&D activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subject to change as conceptual cell design progresses or in response to changes in the D&D schedule.

#### 5.3.1.1 Capital Construction Costs

Disposal facility costs are extremely sensitive to disposal volumes and debris size (i.e., the larger the disposal volumes, the lower the per-unit-volume cost for construction; large debris will result in higher construction cost). Capital construction costs mainly depend on the type of design – size and dimension of disposal cell, type of base barrier or liner, thickness and type of cap cover, leachate collection and management system, and other treatment and monitoring facilities. Construction of patrol roads, fencing, lighting, and surveillance would be included in the facility construction for disposal of classified wastes, which in turn will increase the cost. Cost for soil required for the cell construction would be less if the soil source is onsite as compared to offsite source.

#### 5.3.1.2 Disposal Facility Operational Costs

The size and dimension of the disposal cell, type of waste (LLW or MLLW), waste characteristics, amount of leachate being produced, estimated number of years of operation and degree of security and surveillance provided for the disposal facilities drives the sensitivity for disposal facility operational costs.

### 5.3.1.3 Closure Costs

Closure costs mainly depend on the required thickness, size, type of final cap cover required as per CERCLA or RCRA requirements, and number of years. Cost for soil required for the construction of cover would be less if the soil source is onsite as compared to offsite source. Closure costs also depend upon the number of facilities/systems required to be shut down or deactivated.

### 5.3.1.4 Short-Term Stewardship Costs

Short-term stewardship costs mainly depend on the number of years the facility is required or proposed to be monitored. The sensitivity for short-term stewardship costs also depends on the required frequency of environmental monitoring (air and groundwater monitoring), leachate management, and the degree of security and surveillance needed for the OSWDF.

## 5.4 Sensitivity Evaluation for Filling of Converter Voids

As part of the sensitivity evaluation and analysis, a cost estimate for filling of converter voids was used by DOE to evaluate the cost effectiveness between scenarios with and without size reduction. The estimate was used to compare the cost required for size reduction of the converters during D&D activities and the cost required for void filling of the converters before their disposal into the landfill to reduce the effect of subsidence in the landfill.

Cost estimates for filling converter voids using sand and grout were developed using void volumes provided in Table 5-5 for different converter types. Converter voids are to be filled with either sand or grout to minimize the effect of subsidence in the landfill or of the landfill cover.

**Table 5-5**  
**Converter Void Volumes per Converter Type**

Type of Converter	Volume of Void per Unit per Type (ft <sup>3</sup> )	Volume of Void per Unit per Type (m <sup>3</sup> )	Quantity of Converters	Total Volume of Void per Type (m <sup>3</sup> )
X-33	2,311	65.44	656	42,929
X-31	802	22.71	500	11,355
X-29	776	21.97	600	13,182
X-33	775	21.95	656	14,400
X-31	343	9.71	500	4,855
X-29	304	8.61	600	5,166
<b>Total</b>				<b>91,887</b>

**Source:** Void volumes within converters are based on the volume calculations provided by Theta Pro2Serve Management Company, LLC

### 5.4.1 Cost Estimating Technique

A detailed activity-based cost estimating technique was used to develop this estimate per *Cost Estimating Guide for Program and Project Management* (DOE 2004). This technique is the most definitive of the estimate techniques and uses information down to the lowest level of detail available. Each activity was broken down so that labor hours, material costs, and equipment costs are itemized and quantified.

## 5.4.2 Cost Estimating Procedure

Two separate cost estimates in current FY 2006 dollars are developed to compare the total cost of filling the converter voids using either sand or grout. The following methodology was followed in evaluating and estimating the current unit cost of void filling and is tabulated in Tables K1 and K2, Appendix K.

- Based on the converter volume data provided by TPMC (Table 5-5) the total volume of voids was converted to m<sup>3</sup>.
- Estimated local material cost for sand of \$20 per yd<sup>3</sup> delivered in stockpiles and for grout of \$80 per yd<sup>3</sup> delivered by direct chute method was used. In addition to material costs, a 10 percent markup is included to account for use of cleared delivery personnel.
- It is assumed that water is available at no charge at the location.
- Labor costs used in the estimate were provided by PT&C used for the D&D portion of the work. It is assumed that a crew of three hazardous material handlers at \$46.09 per hour, one operating engineer (Group 1) at \$49.68 per hour, and one foreman at \$63.47 per hour will be used for 8-hour day per converter.
- For equipment cost, an allowance of \$1,000 per day for equipment was assumed. The exact type of equipment cannot be ascertained because of the unknown internal converter configurations.
- Based on the total volume, material costs for sand and grout, labor costs, and equipment costs, a current (FY 2006) unit cost was estimated (Tables K1 and K2, Appendix K) for sand and grout filling.
- Based on the estimated unit costs for void filling and total void volume, the total current (FY 2006) cost was calculated and is presented in Tables K3 and K4, Appendix K. A contingency of 20 percent was applied to the total cost and was rounded to the nearest \$1,000. Table 5-6 presents the estimated total cost for sand and grout filling of converter voids.

**Table 5-6**  
**Total Cost for Sand and**  
**Grout Filling of Converter Voids**

<i>Fill Type</i>	<i>Total Cost</i>
Sand Filling	\$18,451,000
Grout Filling	\$19,646,000

*This Page was Intentionally Left Blank*

## Section 6

### References

U. S. Department of Energy (DOE). United States General Accounting Office. 2000a. *Low-Level Radioactive Wastes, Department of Energy Has Opportunities to Reduce Disposal Costs*. April.

\_\_\_\_\_. Office of Environmental Management. 2000b. *The Current and Planned Low-Level Waste Disposal Capacity Report, Revision 2*. December.

\_\_\_\_\_. Office of Environmental Management. 2002. *The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities*. March.

\_\_\_\_\_. Office of Environmental Management. 2002. *Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH*. June.

\_\_\_\_\_. Office of Management, Budget and Evaluation. 2004. *2004 - Cost Estimating Guide for Program and Project Management*, DOE G 430.1-1X. April.

\_\_\_\_\_. 2005. *On-Site Disposal Facility (OSDF) Interim Remedial Action Report for Operable Unit 5 - (Draft)*, Fernald Closure Project. January.

\_\_\_\_\_. United States General Accounting Office. 2005. *Improved Guidance, Oversight, and Planning Are Needed to Better Identify Cost-Saving Alternatives for Managing Low-Level Radioactive Waste*. October.

\_\_\_\_\_. 2006a. Cost Engineering Group web site <<http://oecm.energy.gov/Default.aspx?tabid=263>>

\_\_\_\_\_. 2006b. Office of Environmental Management's web site (*Fernald On-Site Disposal Facility, Hanford Environmental Restoration Disposal Facility, INEEL CERCLA Disposal Facility, Oak Ridge Environmental Management Waste Management Facility*) - <<http://web.em.doe.gov/profiles/>>

Idaho National Engineering and Environmental Laboratory. 2003. *Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison*, EDF-2385. February.



*This Page was Intentionally Left Blank*

## Appendix A

### Background Information and Cost Data

Background Information and Cost Data  
Pre-Disposal and Disposal Costs  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table A1

Item	Work or Material	Cost Source	DOE CERCLA Disposal Facilities															
			Hanford ERDF				Oak Ridge EMWMF				INEEL ICDF				Fernald OSDF			
			Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate
1	Pre-Disposal	<i>The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.</i>	7,499,569	\$40	<u><b>\$299,982,760</b></u>	FY02									1,387,693	<u><b>\$226</b></u>	<u><b>\$313,618,618</b></u>	FY02
1A	Preparation		7,499,569	\$5	<u><b>\$37,497,845</b></u>	FY02									1,387,693	\$137	<u><b>\$190,113,941</b></u>	FY02
1B	Packaging		7,499,569	\$0	<u><b>\$0</b></u>	FY02									1,387,693	\$16	<u><b>\$22,203,088</b></u>	FY02
1C	Transportation		7,499,569	\$35	<u><b>\$262,484,915</b></u>	FY02									1,387,693	\$73	<u><b>\$101,301,589</b></u>	FY02
2	Disposal	<i>The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.</i>	7,499,569	<u><b>\$52</b></u>	\$385,974,000	FY02	1,310,368	<u><b>\$160</b></u>	\$208,059,000	FY02	316,453	<u><b>\$194</b></u>	\$61,255,000	FY02	1,387,693	<u><b>\$302</b></u>	\$419,284,000	FY02
2A	Capital Construction		7,499,569	<u><b>\$6</b></u>	\$43,342,000	FY02	1,310,368	<u><b>\$66</b></u>	\$86,231,000	FY02	316,453	<u><b>\$65</b></u>	\$20,453,000	FY02	1,387,693	<u><b>\$64</b></u>	\$88,850,000	FY02
2B	Disposal Facility Operation		7,499,569	<u><b>\$31</b></u>	\$235,182,000	FY02	1,310,368	<u><b>\$49</b></u>	\$63,354,000	FY02	316,453	<u><b>\$61</b></u>	\$19,364,000	FY02	1,387,693	<u><b>\$70</b></u>	\$97,650,000	FY02
2C	Closure		7,499,569	<u><b>\$8</b></u>	\$57,450,000	FY02	1,310,368	<u><b>\$37</b></u>	\$48,474,000	FY02	316,453	<u><b>\$29</b></u>	\$9,105,000	FY02	1,387,693	<u><b>\$20</b></u>	\$27,500,000	FY02
2D	Post-Closure/Long-Term Stewardship		7,499,569	<u><b>\$7</b></u>	\$50,000,000	FY02	1,310,368	<u><b>\$8</b></u>	\$10,000,000	FY02	316,453	<u><b>\$39</b></u>	\$12,333,000	FY02	1,387,693	<u><b>\$148</b></u>	\$205,284,000	FY02
2	Disposal	<i>Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM</i>					1,299,743	\$180	<u><b>\$233,953,740</b></u>	FY02	510,000	<u><b>\$170</b></u>	\$86,604,000	FY02	1,911,387	\$135	<u><b>\$258,037,245</b></u>	FY02
2A	Capital Construction						1,299,743	\$61	<u><b>\$79,284,323</b></u>	FY02	510,000	<u><b>\$92</b></u>	\$46,852,000	FY02	1,911,387	\$84	<u><b>\$160,556,508</b></u>	FY02
2B	Disposal Facility Operation						1,299,743	\$61	<u><b>\$79,284,323</b></u>	FY02	510,000	<u><b>\$30</b></u>	\$15,388,000	FY02	1,911,387	\$16	<u><b>\$30,582,192</b></u>	FY02
2C	Closure	<i>INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL</i>					1,299,743	\$26	<u><b>\$33,793,318</b></u>	FY02	510,000	<u><b>\$37</b></u>	\$18,699,000	FY02	1,911,387	\$22	<u><b>\$42,050,514</b></u>	FY02
2D	Post-Closure/Long-Term Stewardship						1,299,743	\$32	<u><b>\$41,591,776</b></u>	FY02	510,000	<u><b>\$11</b></u>	\$5,665,000	FY02	1,911,387	\$13	<u><b>\$24,848,031</b></u>	FY02

Fernald OSDF									
Item	Disposal Cells	Unit Quantity (m³)	Actual Construction		Actual Engineering		Actual Cost		Date of Estimate
			Total Cost	Unit Price (\$/m³)	Total Cost	Unit Price (\$/m³)	Total Actual Cost	Unit Price (\$/m³)	
1	Cell No. 1	240,287	\$16,362,000	<u><b>\$68</b></u>	\$5,500,000	<u><b>\$23</b></u>	\$21,862,000	<u><b>\$91</b></u>	FY00
2	Cell No. 2	288,345	\$23,127,000	<u><b>\$80</b></u>	\$7,774,000	<u><b>\$27</b></u>	\$30,901,000	<u><b>\$107</b></u>	FY02
3	Cell No. 3	284,287	\$21,402,000	<u><b>\$75</b></u>	\$7,194,000	<u><b>\$25</b></u>	\$28,596,000	<u><b>\$101</b></u>	FY04

Source: Table 3-1 & Attachment 1, OSDF Interim Remedial Action Report for Operable Unit 5 - January 2005 (Draft), Fernald Closure Project

- Note:**
- Bold numbers are estimated values and bold with underline are calculated values from available data.
  - Unit price rounded to nearest whole dollar
  - Pre-disposal and disposal costs are calculated by adding ther respective cost elements.

Background Information and Cost Data  
Pre-Disposal and Disposal Costs  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table A2

Item	Work or Material	Cost Source	DOE Non-CERCLA Disposal Facilities																								
			Savannah River Site Trenches				Nevada Test Site					INEEL RWMC				Hanford LLBG						Savannah River Site Vaults					
			Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)		Total price		Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)		Total price		Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	
						Minimum	Maximum	Minimum	Maximum							Minimum	Maximum	Minimum	Maximum								
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.						573,086	\$205	\$10,400	\$117,482,630	\$5,960,094,400	FY02					75,565	\$205	\$10,400	\$15,490,825	\$785,876,000	FY02				
1A	Preparation						573,086	\$130	\$2,400	\$74,501,180	\$1,375,406,400	FY02					75,565	\$130	\$2,400	\$9,823,450	\$181,356,000	FY02					
1B	Packaging						573,086	\$25	\$2,000	\$14,327,150	\$1,146,172,000	FY02					75,565	\$25	\$2,000	\$1,889,125	\$151,130,000	FY02					
1C	Transportation						573,086	\$50	\$6,000	\$28,654,300	\$3,438,516,000	FY02					75,565	\$50	\$6,000	\$3,778,250	\$453,390,000	FY02					
2	Disposal		139,768	\$325	\$45,453,000	FY02	573,086	\$500		\$286,689,000		FY02	49,165	\$1,705	\$83,865,000	FY02	75,565	\$3,742		\$282,782,000		FY02	27,365	\$3,671	\$100,438,000	FY02	
2A	Capital Construction		139,768	\$0	\$0	FY02	573,086	\$6		\$3,466,000		FY02	49,165	\$118	\$5,820,000	FY02	75,565	\$13		\$1,013,000		FY02	27,365	\$2,346	\$64,204,000	FY02	
2B	Disposal Facility Operation		139,768	\$119	\$16,653,000	FY02	573,086	\$369		\$211,483,000		FY02	49,165	\$489	\$24,045,000	FY02	75,565	\$2,022		\$152,769,000		FY02	27,365	\$363	\$9,934,000	FY02	
2C	Closure		139,768	\$27	\$3,800,000	FY02	573,086	\$10		\$5,854,000		FY02	49,165	\$81	\$4,000,000	FY02	75,565	\$1,045		\$79,000,000		FY02	27,365	\$48	\$1,300,000	FY02	
2D	Post-Closure/Long-Term Stewardship		139,768	\$179	\$25,000,000	FY02	573,086	\$115		\$65,886,000		FY02	49,165	\$1,017	\$50,000,000	FY02	75,565	\$662		\$50,000,000		FY02	27,365	\$914	\$25,000,000	FY02	
2	Disposal	Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM																									
2A	Capital Construction																										
2B	Disposal Facility Operation																										
2C	Closure	INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL																									
2D	Post-Closure/Long-Term Stewardship																										

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m³ - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note:

- Bold numbers are estimated values and bold with underline are calculated values from available data.
- Unit price rounded to nearest whole dollar
- Pre-disposal and disposal costs are calculated by adding their respective cost elements.

Background Information and Cost Data  
Pre-Disposal and Disposal Costs  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table A3

Item	Work or Material	Cost Source	DOE (5 On-Site Facilities: NTS, Hanford LLBG & ERDF, Savannah River Site Trenches, and Fernald OSDF)						Weldon Spring - DOE Disposal Facility			
			Unit Quantity (m³)	Unit Price (\$/m³)		Total price		Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate
				Minimum	Maximum	Minimum	Maximum					
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.	9,675,681	\$30	\$14,700	\$290,270,430	\$142,232,510,700	FY02				
1A	Preparation		9,675,681	\$5	\$6,700	\$48,378,405	\$64,827,062,700	FY02				
1B	Packaging		9,675,681	\$0	\$2,000	\$0	\$19,351,362,000	FY02				
1C	Transportation		9,675,681	\$25	\$6,000	\$241,892,025	\$58,054,086,000	FY02				
2	Disposal	Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM										
2A	Capital Construction											
2B	Disposal Facility Operation											
2C	Closure											
2D	Post-Closure/Long-Term Stewardship											
2	Disposal	INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL							1,146,832	\$160	\$183,493,120	FY02
2A	Capital Construction								1,146,832	\$97	\$111,242,704	FY02
2B	Disposal Facility Operation								1,146,832	\$12	\$13,761,984	FY02
2C	Closure								1,146,832	\$9	\$10,321,488	FY02
2D	Post-Closure/Long-Term Stewardship								1,146,832	\$42	\$48,166,944	FY02

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m<sup>3</sup> - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note:

1. Bold numbers are estimated values and bold with underline are calculated values from available data.
2. Unit price rounded to nearest whole dollar
3. Pre-disposal and disposal costs are calculated by adding their respective cost elements.

Background Information and Cost Data  
Pre-Disposal and Disposal Costs  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table A4

Item	Work or Material	Cost Source	Commercial Disposal Facilities																	
			Envirocare (Soil)				Envirocare (Debris)				Barnwell				US Ecology					
			Unit Quantity (m³)	Unit Price (\$/m³)		Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)		Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate	Unit Quantity (m³)	Unit Price (\$/m³)	Total price	Date of Estimate
				Minimum	Maximum				Minimum	Maximum										
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.		\$202	\$2,300		FY02		\$202	\$2,300		FY02								
1A	Preparation			\$30	\$880		FY02		\$30	\$880		FY02								
1B	Packaging			\$88	\$1,000		FY02		\$88	\$1,000		FY02								
1C	Transportation			\$84	\$420		FY02		\$84	\$420		FY02								
2	Disposal			\$180			FY02		\$520			FY02		\$14,000		FY02		\$2,500		FY02
2A	Capital Construction																			
2B	Disposal Facility Operation																			
2C	Closure																			
2D	Post-Closure/Long-Term Stewardship																			
2	Disposal	Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM																		
2A	Capital Construction																			
2B	Disposal Facility Operation																			
2C	Closure	INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL																		
2D	Post-Closure/Long-Term Stewardship																			

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m³ - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note:

- 1. Bold numbers are estimated values and bold with underline are calculated values from available data.
- 2. Unit price rounded to nearest whole dollar
- 3. Pre-disposal and disposal costs are calculated by adding their respective cost elements.

## Appendix B

### Statistical Analysis of Background Information and Cost Data

Statistical Analysis of Cost  
Escalation of All Data in Table A for Pre-Disposal and Disposal Costs To FY2006  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table B1

Item	Work or Material	Cost Source	DOE CERCLA Disposal Facilities											
			Hanford ERDF			Oak Ridge EMWMF			INEEL ICDF			Fernald OSDF		
			Unit Quantity (m³)	Unit Price Escalation (\$/m³)		Unit Quantity (m³)	Unit Price Escalation (\$/m³)		Unit Quantity (m³)	Unit Price Escalation (\$/m³)		Unit Quantity (m³)	Unit Price Escalation (\$/m³)	
				FY2002	FY2006		FY2002	FY2006		FY2002	FY2006		FY2002	FY2006
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.	7,499,569	<u>\$40</u>	<u>\$45</u>							1,387,693	<u>\$226</u>	<u>\$250</u>
1A	Preparation		7,499,569	\$5	<u>\$6</u>							1,387,693	\$137	<u>\$151</u>
1B	Packaging		7,499,569	\$0	<u>\$0</u>							1,387,693	\$16	<u>\$18</u>
1C	Transportation		7,499,569	\$35	<u>\$39</u>							1,387,693	\$73	<u>\$81</u>
2	Disposal		7,499,569	<u>\$52</u>	<u>\$58</u>	1,310,368	<u>\$160</u>	<u>\$177</u>	316,453	<u>\$194</u>	<u>\$214</u>	1,387,693	<u>\$302</u>	<u>\$333</u>
2A	Capital Construction		7,499,569	<u>\$6</u>	<u>\$7</u>	1,310,368	<u>\$66</u>	<u>\$73</u>	316,453	<u>\$65</u>	<u>\$72</u>	1,387,693	<u>\$64</u>	<u>\$71</u>
2B	Disposal Facility Operation		7,499,569	<u>\$31</u>	<u>\$34</u>	1,310,368	<u>\$49</u>	<u>\$54</u>	316,453	<u>\$61</u>	<u>\$67</u>	1,387,693	<u>\$70</u>	<u>\$77</u>
2C	Closure		7,499,569	<u>\$8</u>	<u>\$9</u>	1,310,368	<u>\$37</u>	<u>\$41</u>	316,453	<u>\$29</u>	<u>\$32</u>	1,387,693	<u>\$20</u>	<u>\$22</u>
2D	Post-Closure/Long-Term Stewardship		7,499,569	<u>\$7</u>	<u>\$8</u>	1,310,368	<u>\$8</u>	<u>\$9</u>	316,453	<u>\$39</u>	<u>\$43</u>	1,387,693	<u>\$148</u>	<u>\$163</u>
2	Disposal	Oak Ridge, Fernald, & Weldon Spring: Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM				1,299,743	\$180	<u>\$198</u>	510,000	<u>\$170</u>	<u>\$187</u>	1,911,387	\$135	<u>\$149</u>
2A	Capital Construction					1,299,743	\$61	<u>\$67</u>	510,000	<u>\$92</u>	<u>\$101</u>	1,911,387	\$84	<u>\$93</u>
2B	Disposal Facility Operation					1,299,743	\$61	<u>\$67</u>	510,000	<u>\$30</u>	<u>\$33</u>	1,911,387	\$16	<u>\$18</u>
2C	Closure	INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL				1,299,743	\$26	<u>\$29</u>	510,000	<u>\$37</u>	<u>\$41</u>	1,911,387	\$22	<u>\$24</u>
2D	Post-Closure/Long-Term Stewardship					1,299,743	\$32	<u>\$35</u>	510,000	<u>\$11</u>	<u>\$12</u>	1,911,387	\$13	<u>\$14</u>

Escalation Indices		Source
FY2000	0.974	Departmental Price Change Index, January 2001 Update, FY 2003 Guidance. <u>Anticipated Economic Escalation Rates,</u> <u>DOE Construction Projects And Operating Expenses.</u>
FY2002	1.027	
Calc. Escalation Factor:		
FY2000 to 2002	<u>1.054</u>	Escalation Rate Assumptions For Projects (January 2004, U.S. Department of Energy, Office of Management.
FY2002	1.000	
FY2004	1.047	
FY2006	1.103	
Calc. Escalation Factor:		
FY2004 to 2006	<u>1.054</u>	
FY2002 to 2006	<u>1.103</u>	
FY 2000 to 2006	<u>1.163</u>	

Fernald OSDF										
Disposal Cells	Unit Quantity (m³)	Actual Construction			Actual Engineering			Actual Cost		
		Date of Estimate	Unit Price Escalation (\$/m³)		Date of Estimate	Unit Price Escalation (\$/m³)		Date of Estimate	Unit Price Escalation (\$/m³)	
				FY2006			FY2006			FY2006
Cell No. 1	240,287	FY2000	<u>\$68</u>	<u>\$79</u>	FY2000	<u>\$23</u>	<u>\$27</u>	FY2000	<u>\$91</u>	<u>\$106</u>
Cell No. 2	288,345	FY2002	<u>\$80</u>	<u>\$88</u>	FY2002	<u>\$27</u>	<u>\$30</u>	FY2002	<u>\$107</u>	<u>\$118</u>
Cell No. 3	284,287	FY2004	<u>\$75</u>	<u>\$79</u>	FY2004	<u>\$25</u>	<u>\$26</u>	FY2004	<u>\$101</u>	<u>\$106</u>

Source: Table 3-1 & Attachment 1, OSDF Interim Remedial Action Report for Operable Unit 5 - January 2005 (Draft), Fernald Closure Project

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m³ - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note: 1. Bold numbers are estimated values and bold with underline are calculated values from available data.  
2. Unit price rounded to nearest whole dollar 3. Pre-disposal and disposal costs are calculated by adding ther respective cost elements.



Statistical Analysis of Cost  
Escalation of All Data in Table A for Pre-Disposal and Disposal Costs To FY2006  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table B2

Item	Work or Material	Cost Source	DOE Non-CERCLA Disposal Facilities																						
			Savannah River Site Trenches			Nevada Test Site						INEEL RWMC			Hanford LLBG								Savannah River Site Vaults		
			Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Minimum Unit Price Escalation (\$/m <sup>3</sup> )		Maximum Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Minimum Unit Price Escalation (\$/m <sup>3</sup> )		Maximum Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )	
				FY2002	FY2006		FY2002	FY2006	FY2002	FY2006	FY2002	FY2006		FY2002	FY2006		FY2002	FY2006	FY2002	FY2006	FY2002	FY2006		FY2002	FY2006
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.				573,086			\$205	\$226	\$10,400	\$11,471				75,565			\$205	\$226	\$10,400	\$11,471			
1A	Preparation					573,086			\$130	\$143	\$2,400	\$2,647				75,565			\$130	\$143	\$2,400	\$2,647			
1B	Packaging					573,086			\$25	\$28	\$2,000	\$2,206				75,565			\$25	\$28	\$2,000	\$2,206			
1C	Transportation					573,086			\$50	\$55	\$6,000	\$6,618				75,565			\$50	\$55	\$6,000	\$6,618			
2	Disposal		139,768	\$325	\$358	573,086	\$500	\$552					49,165	\$1,705	\$1,880	75,565	\$3,742	\$4,127					27,365	\$3,671	\$4,049
2A	Capital Construction		139,768	\$0	\$0	573,086	\$6	\$7					49,165	\$118	\$130	75,565	\$13	\$14					27,365	\$2,346	\$2,588
2B	Disposal Facility Operation		139,768	\$119	\$131	573,086	\$369	\$407					49,165	\$489	\$539	75,565	\$2,022	\$2,230					27,365	\$363	\$400
2C	Closure		139,768	\$27	\$30	573,086	\$10	\$11					49,165	\$81	\$89	75,565	\$1,045	\$1,153					27,365	\$48	\$53
2D	Post-Closure/Long-Term Stewardship		139,768	\$179	\$197	573,086	\$115	\$127					49,165	\$1,017	\$1,122	75,565	\$662	\$730					27,365	\$914	\$1,008
2	Disposal	Oak Ridge, Fernald, & Weldon Spring: Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM																							
2A	Capital Construction																								
2B	Disposal Facility Operation																								
2C	Closure		INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL																						
2D	Post-Closure/Long-Term Stewardship																								

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m<sup>3</sup> - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note:

- Bold numbers are estimated values and bold with underline are calculated values from available data.
- Unit price rounded to nearest whole dollar
- Pre-disposal and disposal costs are calculated by adding ther respective cost elements.

Escalation Indices		Source
FY2000	0.974	Departmental Price Change Index, January 2001 Update, FY 2003 Guidance. <u>Anticipated Economic Escalation Rates,</u> <u>DOE Construction Projects And Operating Expenses.</u>
FY2002	1.027	
Calc. Escalation Factor:		
FY2000 to 2002	<u>1.054</u>	Escalation Rate Assumptions For Projects (January 2004, U.S. Department of Energy, Office of Management.
FY2002	1.000	
FY2004	1.047	
FY2006	1.103	
Calc. Escalation Factor:		
FY2004 to 2006	<u>1.054</u>	
FY2002 to 2006	<u>1.103</u>	
FY 2000 to 2006	<u>1.163</u>	

Statistical Analysis of Cost
Table B3
Escalation of All Data in Table A for Pre-Disposal and Disposal Costs To FY2006
U.S. Department of Energy- On-Site Waste Disposal Facility
PORTS D&D Project, Ohio

Item	Work or Material	Cost Source	DOE (5 On-Site Facilities: NTS, Hanford LLBG & ERDF, Savannah River Site Trenches, and Fernald OSDF)					Weldon Spring - DOE Disposal Facility		
			Unit Quantity (m³)	Minimum Unit Price Escalation (\$/m³)		Maximum Unit Price Escalation (\$/m³)		Unit Quantity (m³)	Unit Price Escalation (\$/m³)	
				FY2002	FY2006	FY2002	FY2006		FY2002	FY2006
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.	9,675,681	\$30	\$34	\$14,700	\$16,214			
1A	Preparation		9,675,681	\$5	\$6	\$6,700	\$7,390			
1B	Packaging		9,675,681	\$0	\$0	\$2,000	\$2,206			
1C	Transportation		9,675,681	\$25	\$28	\$6,000	\$6,618			
2	Disposal									
2A	Capital Construction									
2B	Disposal Facility Operation									
2C	Closure									
2D	Post-Closure/Long-Term Stewardship									
2	Disposal	Oak Ridge, Fernald, & Weldon Spring: Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM						1,146,832	\$160	\$176
2A	Capital Construction							1,146,832	\$97	\$107
2B	Disposal Facility Operation							1,146,832	\$12	\$13
2C	Closure		INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL					1,146,832	\$9	\$10
2D	Post-Closure/Long-Term Stewardship							1,146,832	\$42	\$46

Escalation Indices		Source
FY2000	0.974	Departmental Price Change Index, January 2001 Update, FY 2003 Guidance. <u>Anticipated Economic Escalation Rates,</u> <u>DOE Construction Projects And Operating Expenses.</u>
FY2002	1.027	
Calc. Escalation Factor:		
FY2000 to 2002	<u>1.054</u>	Escalation Rate Assumptions For Projects (January 2004, U.S. Department of Energy, Office of Management.
FY2002	1.000	
FY2004	1.047	
FY2006	1.103	
Calc. Escalation Factor:		
FY2004 to 2006	<u>1.054</u>	
FY2002 to 2006	<u>1.103</u>	
FY 2000 to 2006	<u>1.163</u>	

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m³ - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Note:

- 1. Bold numbers are estimated values and bold with underline are calculated values from available data.
- 2. Unit price rounded to nearest whole dollar
- 3. Pre-disposal and disposal costs are calculated by adding ther respective cost elements.

Statistical Analysis of Cost  
Escalation of All Data in Table A for Pre-Disposal and Disposal Costs To FY2006  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

Table B4

Item	Work or Material	Cost Source	Commercial Disposal Facilities																			
			Envirocare (Soil)						Envirocare (Debris)						Barnwell			US Ecology				
			Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Minimum Unit Price Escalation (\$/m <sup>3</sup> )		Maximum Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Minimum Unit Price Escalation (\$/m <sup>3</sup> )		Maximum Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )		Unit Quantity (m <sup>3</sup> )	Unit Price Escalation (\$/m <sup>3</sup> )	
				FY2002	FY2006	FY2002	FY2006	FY2002	FY2006		FY2002	FY2006	FY2002	FY2006	FY2002	FY2006		FY2002	FY2006		FY2002	FY2006
1	Pre-Disposal	The Cost of Waste Disposal: Life Cycle Cost Analysis of Disposal of Department of Energy Low-Level Radioactive Waste at Federal and Commercial Facilities, March 2002, U.S. Department of Energy, Office of Environmental Management.				<u>\$202</u>	<u>\$223</u>	<u>\$2,300</u>	<u>\$2,537</u>				<u>\$202</u>	<u>\$223</u>	<u>\$2,300</u>	<u>\$2,537</u>						
1A	Preparation					\$30	<u>\$33</u>	\$880	<u>\$971</u>				\$30	<u>\$33</u>	\$880	<u>\$971</u>						
1B	Packaging					\$88	<u>\$97</u>	\$1,000	<u>\$1,103</u>				\$88	<u>\$97</u>	\$1,000	<u>\$1,103</u>						
1C	Transportation					\$84	<u>\$93</u>	\$420	<u>\$463</u>				\$84	<u>\$93</u>	\$420	<u>\$463</u>						
2	Disposal	Oak Ridge, Fernald, & Weldon Spring: Preliminary Assessment for a Potential On-Site Waste Disposal Facility at the Portsmouth Gaseous Diffusion Plant, Piketon, OH, June 2002, U.S. DOE, Office of EM		\$180	<u>\$199</u>						\$520	<u>\$574</u>						\$14,000	<u>\$15,442</u>		\$2,500	<u>\$2,758</u>
2A	Capital Construction																					
2B	Disposal Facility Operation																					
2C	Closure																					
2D	Post-Closure/Long-Term Stewardship																					
2	Disposal	INEEL ICDF: Engineering Design File, INEEL CERCLA Disposal Facility Complex On-Site Versus Off-Site Cost Comparison, EDF-2385, February 2003, INEEL																				
2A	Capital Construction																					
2B	Disposal Facility Operation																					
2C	Closure																					
2D	Post-Closure/Long-Term Stewardship																					

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, DOE - U.S. Department of Energy, EMWMF - Environmental Management Waste Management Facility, ERDF - Environmental Restoration Disposal Facility, ICDF - INEEL CERCLA Disposal Facility, INEEL - Idaho National Engineering and Environmental Laboratory, LLBG - Low-Level Burial Grounds, LLW - Low-Level Radioactive Waste, m³ - Cubic Meter, OSDF - On-Site Disposal Facility, RWMC - Radioactive Waste Management Complex

Escalation Indices		Source
FY2000	0.974	Departmental Price Change Index, January 2001 Update, FY 2003 Guidance. <u>Anticipated Economic Escalation Rates, DOE Construction Projects And Operating Expenses.</u>
FY2002	1.027	
Calc. Escalation Factor:		
FY2000 to 2002	<u>1.054</u>	Escalation Rate Assumptions For Projects (January 2004, U.S. Department of Energy, Office of Management.
FY2002	1.000	
FY2004	1.047	
FY2006	1.103	
Calc. Escalation Factor:		
FY2004 to 2006	<u>1.054</u>	
FY2002 to 2006	<u>1.103</u>	
FY 2000 to 2006	<u>1.163</u>	

Note:

1. Bold numbers are estimated values and bold with underline are calculated values from available data.
2. Unit price rounded to nearest whole dollar
3. Pre-disposal and disposal costs are calculated by adding their respective cost elements.

# DEPARTMENTAL PRICE CHANGE INDEX

January 2001 Update

FY 2003 Guidance

## ANTICIPATED ECONOMIC ESCALATION RATES

### DOE CONSTRUCTION PROJECTS AND OPERATING EXPENSES

	Energy Research and Nuclear		Fossil		Conservation and Solar		Defense Programs and Gen. Constr.		Environmental Restoration		Waste Management		Operating Expenses	
Fiscal Year	Index	% Change	Index	% Change	Index	% Change	Index	% Change	Index	% Change	Index	% Change	Index	% Change
2000	0.975	N/A	0.975	N/A	0.975	N/A	0.977	N/A	0.974	N/A	0.977	N/A	0.979	N/A
2001	1.000	2.5	1.000	2.5	1.000	2.5	1.000	2.3	1.000	2.6	1.000	2.3	1.000	2.1
2002	1.026	2.6	1.026	2.6	1.025	2.5	1.024	2.4	1.027	2.7	1.024	2.4	1.021	2.1
2003	1.054	2.8	1.053	2.7	1.051	2.6	1.052	2.8	1.054	2.7	1.049	2.5	1.042	2.1
2004	1.082	2.8	1.081	2.8	1.078	2.7	1.081	2.9	1.082	2.8	1.075	2.6	1.063	2.1
2005	1.111	2.9	1.109	2.8	1.105	2.7	1.110	2.9	1.110	2.8	1.100	2.5	1.084	2.1
2006	1.140	2.9	1.138	2.9	1.133	2.8	1.140	3.0	1.139	2.9	1.126	2.6	1.105	2.1
2007	1.174	3.0	1.171	2.9	1.165	2.8	1.174	3.0	1.171	2.9	1.155	2.6	1.128	2.1

Based on the materials and labor data contained in the Energy Supply Planning Model and appropriate escalation rates forecasted it would be expected that DOE projects conform to those rates shown. It is recommended that any local rates different from those above be submitted to the Office of Engineering and Construction Management for approval prior to their use. Additional advice and assistance can be obtained from the Director of Office of Engineering and Construction Management 202-586-4027.

**Escalation Rate Assumptions  
For DOE Projects  
(January 2004)**

	<b>Project Categories*</b>									
	<b>Construction</b>		<b>EM</b>		<b>IT</b>		<b>O&amp;M</b>		<b>R&amp;D</b>	
<b>FY</b>	<b>Index</b>	<b>%</b>	<b>Index</b>	<b>Rate</b>	<b>Index</b>	<b>Rate</b>	<b>Index</b>	<b>Rate</b>	<b>Index</b>	<b>Rate</b>
2002	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
2003	1.021	2.1	1.020	2.0	1.008	0.8	1.018	1.8	1.023	2.3
2004	1.046	2.5	1.047	2.7	1.017	0.9	1.045	2.6	1.051	2.8
2005	1.076	2.9	1.075	2.7	1.022	0.5	1.073	2.7	1.080	2.7
2006	1.106	2.8	1.103	2.6	1.032	1.0	1.101	2.6	1.108	2.6
2007	1.135	2.6	1.130	2.4	1.041	0.8	1.127	2.4	1.136	2.5
2008	1.164	2.6	1.157	2.4	1.049	0.8	1.154	2.4	1.164	2.5
2009	1.194	2.6	1.185	2.4	1.057	0.8	1.182	2.4	1.193	2.5

These Rates are based on Material and Labor data contained in the Energy Supply Model, provided by Global Insight, in January 2002. Locally obtained rates, different from those above, may be used. Additional advice and assistance can be obtained from OECM. Point of Contact: T. Ross Hallman, National Energy Technology Laboratory (NETL), 304-285-4837.

\* Note that these Project Categories are aligned with those *Project Types* in the Project Assessment and Reporting System (PARS), which are included as follows: (1) System; (2) Facility Construction; (3) Infrastructure Improvements; (4) Restoration; (5) Disposition; (6) Information Technology; (7) Plant.

Construction (PARS Project Type (2) Facility Construction and (3) Infrastructure Improvements):

Includes Vertical (e.g. General Building Construction, Administration Buildings, Lab Facilities); Horizontal (e.g. Railroads, Road Work, Bridges, Tunneling, Site Improvements, Site Utilities, Dams / Waterways); and Facilities / Infrastructure (e.g. Chemical Plants, Vitrification Plants, Process Plants, Incinerators, Accelerators, One-of-a-Kind Facilities, and Modifications).

Environmental Management (EM) (PARS Project Types (4) Restoration and (5) Disposition):

Includes Restoration (e.g. Groundwater Remediation, Soils Remediation) and D&D/d&d (e.g. Reactors, Process Facilities, Administration Facilities, Medical Facilities, Laboratory Facilities, Security Facilities).

Information Technology (IT) (PARS Project Type (6) Information Technology):

Includes Hardware, Software, Modeling / Simulation

Operations and Maintenance (O&M) (PARS Project Type (7) Plant):

Includes Lab O&M (e.g. Equipment Replacement, System Maintenance, HEPA Maintenance, Equipment Maintenance); Production O&M (e.g. Chemical Processing, Vitrification Operations, Waste Management, Manufacturing); and Other O&M (e.g. Maintenance Work, Roof Replacement, Building Systems, Landlord Activities, Hotel Load Maintenance).

Research and Development (R&D) (PARS Project Type (1) System):

Includes R&D (e.g. Fossil Energy, Energy Research, Solar Energy, Alternative Energy Sources); Applied Science (e.g. Medical, Basic Science); and Nuclear R&D (e.g. Weapons Production, Security Infrastructure, Weapons Simulation, Nuclear Energy).

## Appendix C

Development of Total Cost from Escalated Unit Costs for  
Scenarios I, II, IV, VI, and VIII

**Table C1**

**Statistical Analysis of Escalated Unit Costs from Appendix B**  
**Selection of Escalated Disposal Costs for Life-Cycle Cost Estimate**  
**U.S. Department of Energy- On-Site Waste Disposal Facility**  
**PORTS D&D Project, Ohio**

Item	Work or Material	Selected Unit Prices (Current FY 2006 Dollars) <sup>1</sup>		
		Expected Minimum Unit Cost (\$/m <sup>3</sup> )	Expected Average Unit Cost (\$/m <sup>3</sup> )	Expected High Unit Cost (\$/m <sup>3</sup> )
<b>2</b>	<b>Disposal<sup>2</sup></b>			
2A	Capital Construction	\$67	\$92	\$118
2B	Disposal Facility Operation	\$13	\$47	\$77
2C	Closure	\$10	\$25	\$41
2D	Post-Closure/Long-Term Stewardship	\$9	\$46	\$163
<b>3</b>	<b>Total Disposal Unit Cost</b>	<b>\$99</b>	<b>\$210</b>	<b>\$399</b>

**Note:**

1. Statistical analysis of escalated unit cost for disposal cost only (refer Section 3.3.1).
2. Refer Section 2.1.2 for detail explanation of each cost element.
3. Total disposal unit cost is the addition of its respective sub-cost elements.
4. Facilities selected for disposal unit costs: Fernald OSDF, INEEL ICDF, Oak Ridge EMWMF, Weldon Spring.



TABLE C2

### Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility

### Scenarios I, II, VI and VIII

<b>Site:</b> <b>Location:</b> <b>Phase:</b> <b>Classification:</b> <b>Base Year:</b> <b>Date:</b>	<b>On-Site Waste Disposal Facility</b> <b>Portsmouth, OH</b> <b>Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]</b> <b>Class 5 (Order of Magnitude Estimate)</b> <b>[Overall Cost Accuracy: -30% to +50%]</b> <b>4<sup>th</sup> Quarter, FY 2006</b> <b>August 2006</b>	<b>Description:</b> The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS GDP D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m <sup>3</sup> of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.				
Cost Category ID	Cost Category Description	CURRENT COST IN DOLLARS				
		QUANTITY	UNIT(S)	UNIT COST (\$/m <sup>3</sup> )	TOTAL COST	NOTES
<b>2</b>	<b>Disposal<sup>1</sup></b>					
2A	Capital Construction Cost	1,667,546	m <sup>3</sup>	\$118	\$196,770,428	1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements (Table C1). 2. Unit cost (\$/m <sup>3</sup> ) is only for the total volume of waste to be disposed. 3. The quantity of wastes (volumes and weights) are presented in Table 5-1, Section 5.1.
2B	Disposal Facility Operational Costs	1,667,546	m <sup>3</sup>	\$77	\$128,401,042	
2C	Closure Costs	1,667,546	m <sup>3</sup>	\$41	\$68,369,386	
2D	Post-Closure/Long-Term Stewardship Costs	1,667,546	m <sup>3</sup>	\$163	\$271,809,998	
	<b>SUBTOTAL</b>	<b>1,667,546</b>	<b>m<sup>3</sup></b>	<b>\$399</b>	<b>\$665,350,854</b>	Total disposal costs
	<b>TOTAL CURRENT FY 2006 COST</b>				<b>\$665,351,000</b>	Rounded up to the nearest thousand
<p><b>2A:</b> The costs presented include design, procurement activities, actual construction of the disposal facility and support facilities.</p> <p><b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).</p> <p><b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements.</p> <p><b>2D:</b> Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during delays to waste disposal activities.</p>						

TABLE C3

### Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility (Volume Reduction)

### Scenario IV

<b>Site:</b> <b>Location:</b> <b>Phase:</b> <b>Classification:</b> <b>Base Year:</b> <b>Date:</b>	<b>On-Site Waste Disposal Facility</b> <b>Portsmouth, OH</b> <b>Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]</b> <b>Class 5 (Order of Magnitude Estimate)</b> <b>[Overall Cost Accuracy: -30% to +50%]</b> <b>4<sup>th</sup> Quarter, FY 2006</b> <b>August 2006</b>	<b>Description:</b> The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS GDP D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m <sup>3</sup> of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.				
Cost Category ID	Cost Category Description	CURRENT COST IN DOLLARS				
		QUANTITY	UNIT(S)	UNIT COST (\$/m <sup>3</sup> )	TOTAL COST	NOTES
<b>2</b>	<b>Disposal<sup>1</sup></b>					
2A	Capital Construction Cost	1,587,676	m <sup>3</sup>	\$118	\$187,345,768	1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements (Table C1).
2B	Disposal Facility Operational Costs	1,587,676	m <sup>3</sup>	\$77	\$122,251,052	2. Unit cost (\$/m <sup>3</sup> ) is only for the total volume of waste to be disposed.
2C	Closure Costs	1,587,676	m <sup>3</sup>	\$41	\$65,094,716	3. The quantity of wastes (volumes and weights) are presented in Table 5-2, Section 5.1.
2D	Post-Closure/Long-Term Stewardship Costs	1,587,676	m <sup>3</sup>	\$163	\$258,791,188	
	<b>SUBTOTAL</b>	<b>1,587,676</b>	<b>m<sup>3</sup></b>	<b>\$399</b>	<b>\$633,482,724</b>	Total disposal costs
	<b>TOTAL CURRENT FY 2006 COST</b>				<b>\$633,483,000</b>	Rounded up to the nearest thousand
<b>2A:</b> The costs presented include design, procurement activities, actual construction of the disposal facility and support facilities. <b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). <b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. <b>2D:</b> Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during delays to waste disposal activities.						

## Appendix D

### Derived Annual Costs for Development of Scenarios I, II, IV, VI, and VIII

Annual Costs Per Activity for Scenario I (Prompt D&D)  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

TABLE D1

Activity	Quantity (m <sup>3</sup> )	Unit Cost (\$/m <sup>3</sup> ) <sup>1, 2, 3</sup>	Total Activity Costs	Rounded Total Activity Cost	Projected Design Cell Schedule		Average Duration at Selected DOE Facility <sup>2</sup>		Design Costs (EE/CA & Cell Design)		Capital Construction Cost <sup>4</sup>	\$167,254,500	Disposal Facility Operational Cost	\$128,401,000	Closure Cost	\$68,369,000	
					Years	Annual Cost	Years	Annual Cost									
Capital Construction Cost	1,667,546	\$118	\$196,770,428	\$196,770,000	11	(FY 2007 to FY 2017)		7	\$28,110,000	Total Years	2	Total Years	9	Total Years	15	Total Years	12
Disposal Facility Operational Cost	1,667,546	\$77	\$128,401,042	\$128,401,000	15	(FY 2011 to FY 2025)		9	\$14,267,000	Total Capital Construction Cost	\$196,770,000	Years of Equal Funding	7	Years of Equal Funding	11	Years of Equal Funding	10
Closure Cost	1,667,546	\$41	\$68,369,386	\$68,369,000	12	(FY 2015 to FY 2026)		5	\$13,674,000	Total Design % (EE/CA & Design)	15%	Years of Incremental Funding	2	Years of Incremental Funding	4	Years of Incremental Funding	2
Post-Closure/Long-Term Stewardship Cost	1,667,546	\$163	\$271,809,998	\$271,810,000	100	(FY 2027 to FY 2126)	\$2,718,000	100	\$2,718,000	Total Design Cost	\$29,515,500	Incremental Funding Factor	2	Incremental Funding Factor	1.5	Incremental Funding Factor	2
Note									EE/CA Cost per Year (20% of Total Design - FY 2007)	\$5,903,000	Cost per Year for Equal Funding	\$15,205,000	Cost per Year for Equal Funding	\$7,553,000	Cost per Year for Equal Funding	\$4,884,000	
									Design Cost per Year (80% of Total Design - FY 2007 to FY 2008)	\$11,806,000	Cost per Year for Incremental Funding	\$30,410,000	Cost per Year for Incremental Funding	\$11,330,000	Cost per Year for Incremental Funding	\$9,767,000	

1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements.

2. Facilities selected for disposal unit costs and average years of operation: Fernald OSDF, INEEL ICDF, Oak Ridge EMWMF, Weldon Spring.

7. The following algebraic equation was used to calculate the annual costs: [(Years of Incremental Funding) x (Factor)] + (Years of Equal Funding) = Total Cost

Annual Costs Per Activity for Scenario II (Two Phase D&D)  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

TABLE D2

Activity	Quantity (m <sup>3</sup> )	Unit Cost (\$/m <sup>3</sup> ) <sup>1, 2, 3</sup>	Total Activity Costs	Rounded Total Activity Cost	Projected Design Cell Schedule		Average Duration at Selected DOE Facility <sup>2</sup>		Design Costs (EE/CA & Cell Design)		Capital Construction Cost <sup>4</sup>	\$167,254,500	Disposal Facility Operational Cost	\$128,401,000	Closure Cost	\$68,369,000	
					Years	Annual Cost	Years	Annual Cost									
Capital Construction Cost	1,667,546	\$118	\$196,770,428	\$196,770,000	11	(FY 2007 to FY 2017)		7	\$28,110,000	Total Years	2	Total Years	9	Total Years	19	Total Years	12
Disposal Facility Operational Cost	1,667,546	\$77	\$128,401,042	\$128,401,000	19	(FY 2011 to FY 2024, FY 2039 to FY 2043)		9	\$14,267,000	Total Capital Construction Cost	\$196,770,000	Years of Equal Funding	7	Years of Equal Funding	15	Years of Equal Funding	10
Closure Cost	1,667,546	\$41	\$68,369,386	\$68,369,000	12	(FY 2015 to FY 2024, FY 2043 to FY 2044)		5	\$13,674,000	Total Design % (EE/CA & Design)	15%	Years of Incremental Funding	2	Years of Incremental Funding	4	Years of Incremental Funding	2
Short Term Stewardship					14	(FY 2025 to FY 2038)	\$2,718,000			Total Design Cost	\$29,515,500	Incremental Funding Factor	2	Incremental Funding Factor	1.5	Incremental Funding Factor	2
Post-Closure/Long-Term Stewardship Cost	1,667,546	\$163	\$271,809,998	\$271,810,000	100	(FY 2045 to FY 2144)	\$2,718,000	100	\$2,718,000	EE/CA Cost per Year (20% of Total Design - FY 2007)	<u>\$5,903,000</u>	Cost per Year for Equal Funding	<u>\$15,205,000</u>	Cost per Year for Equal Funding	<u>\$6,114,000</u>	Cost per Year for Equal Funding	<u>\$4,884,000</u>
Note									Design Cost per Year (80% of Total Design - FY 2007 to FY 2008)	<u>\$11,806,000</u>	Cost per Year for Incremental Funding	<u>\$30,410,000</u>	Cost per Year for Incremental Funding	<u>\$9,171,000</u>	Cost per Year for Incremental Funding	<u>\$9,767,000</u>	

7. The following algebraic equation was used to calculate the annual costs: [(Years of Incremental Funding) x (Factor)] + (Years of Equal Funding) = Total Cost

Annual Costs Per Activity for Scenario IV (Prompt D&D with Size Reduction)  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

TABLE D3

Activity	Quantity (m <sup>3</sup> )	Unit Cost (\$/m <sup>3</sup> ) <sup>1, 2, 3</sup>	Total Activity Costs	Rounded Total Activity Cost	Projected Design Cell Schedule		Average Duration at Selected DOE Facility <sup>2</sup>		Design Costs (EE/CA & Cell Design)		Capital Construction Cost <sup>4</sup>	\$159,244,100	Disposal Facility Operational Cost	\$122,251,000	Closure Cost	\$65,095,000	
					Years	Annual Cost	Years	Annual Cost									
Capital Construction Cost	1,587,676	\$118	\$187,345,768	\$187,346,000	11	(FY 2007 to FY 2017)		7	\$26,764,000	Total Years	2	Total Years	9	Total Years	14	Total Years	11
Disposal Facility Operational Cost	1,587,676	\$77	\$122,251,052	\$122,251,000	14	(FY 2011 to FY 2024)		9	\$13,583,000	Total Capital Construction Cost	\$187,346,000	Years of Equal Funding	7	Years of Equal Funding	10	Years of Equal Funding	9
Closure Cost	1,587,676	\$41	\$65,094,716	\$65,095,000	11	(FY 2015 to FY 2025)		5	\$13,019,000	Total Design % (EE/CA & Design)	15%	Years of Incremental Funding	2	Years of Incremental Funding	4	Years of Incremental Funding	2
Post-Closure/Long-Term Stewardship Cost	1,587,676	\$163	\$258,791,188	\$258,791,000	100	(FY 2026 to FY 2125)	\$2,588,000	100	\$2,588,000	Total Design Cost	\$28,101,900	Incremental Funding Factor	2	Incremental Funding Factor	1.5	Incremental Funding Factor	2
Note									EE/CA Cost per Year (20% of Total Design - FY 2007)	\$5,620,000	Cost per Year for Equal Funding	\$14,477,000	Cost per Year for Equal Funding	\$7,641,000	Cost per Year for Equal Funding	\$5,007,000	
									Design Cost per Year (80% of Total Design - FY 2007 to FY 2008)	\$11,241,000	Cost per Year for Incremental Funding	\$28,953,000	Cost per Year for Incremental Funding	\$11,461,000	Cost per Year for Incremental Funding	\$10,015,000	

1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements.

2. Facilities selected for disposal unit costs and average years of operation: Fernald OSDF, INEEL ICDF, Oak Ridge EMWMF, Weldon Spring.

7. The following algebraic equation was used to calculate the annual costs: [(Years of Incremental Funding) x (Factor)] + (Years of Equal Funding) = Total Cost

Annual Costs Per Activity for Scenario VI (Prompt D&D Under RCRA)  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

TABLE D4

Activity	Quantity (m <sup>3</sup> )	Unit Cost (\$/m <sup>3</sup> ) <sup>1, 2, 3</sup>	Total Activity Costs	Rounded Total Activity Cost	Projected Design Cell Schedule		Average Duration at Selected DOE Facility <sup>2</sup>		Design Costs (EE/CA & Cell Design)		Capital Construction Cost <sup>4</sup>	\$167,254,500	Disposal Facility Operational Cost	\$128,401,000	Closure Cost	\$68,369,000	
					Years	Annual Cost	Years	Annual Cost									
Capital Construction Cost	1,667,546	\$118	\$196,770,428	\$196,770,000	11	(FY 2007 to FY 2017)		7	\$28,110,000	Total Years	2	Total Years	9	Total Years	15	Total Years	12
Disposal Facility Operational Cost	1,667,546	\$77	\$128,401,042	\$128,401,000	15	(FY 2011 to FY 2025)		9	\$14,267,000	Total Capital Construction Cost	\$196,770,000	Years of Equal Funding	7	Years of Equal Funding	11	Years of Equal Funding	10
Closure Cost	1,667,546	\$41	\$68,369,386	\$68,369,000	12	(FY 2015 to FY 2026)		5	\$13,674,000	Total Design % (EE/CA & Design)	15%	Years of Incremental Funding	2	Years of Incremental Funding	4	Years of Incremental Funding	2
Post-Closure/Long-Term Stewardship Cost	1,667,546	\$163	\$271,809,998	\$271,810,000	100	(FY 2027 to FY 2126)	\$2,718,000	100	\$2,718,000	Total Design Cost	\$29,515,500	Incremental Funding Factor	2	Incremental Funding Factor	1.5	Incremental Funding Factor	2
<b>Note</b>									EE/CA Cost per Year (20% of Total Design - FY 2007)	<u>\$5,903,000</u>	Cost per Year for Equal Funding	<u>\$15,205,000</u>	Cost per Year for Equal Funding	<u>\$7,553,000</u>	Cost per Year for Equal Funding	<u>\$4,884,000</u>	
									Design Cost per Year (80% of Total Design - FY 2007 to FY 2008)	<u>\$11,806,000</u>	Cost per Year for Incremental Funding	<u>\$30,410,000</u>	Cost per Year for Incremental Funding	<u>\$11,330,000</u>	Cost per Year for Incremental Funding	<u>\$9,767,000</u>	

1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements.

2. Facilities selected for disposal unit costs and average years of operation: Fernald OSDF, INEEL ICDF, Oak Ridge EMWMF, Weldon Spring.

7. The following algebraic equation was used to calculate the annual costs: [(Years of Incremental Funding) x (Factor)] + (Years of Equal Funding) = Total Cost

Annual Costs Per Activity for Scenario VIII (Two Phase D&D with Funding Constraints)  
U.S. Department of Energy- On-Site Waste Disposal Facility  
PORTS D&D Project, Ohio

TABLE D5

Activity	Quantity (m <sup>3</sup> )	Unit Cost (\$/m <sup>3</sup> ) <sup>1, 2, 3</sup>	Total Activity Costs	Rounded Total Activity Cost	Projected Design Cell Schedule		Average Duration at Selected DOE Facility <sup>2</sup>		Design Costs (EE/CA & Cell Design)		Capital Construction Cost <sup>4</sup>	\$167,254,500	Disposal Facility Operational Cost	\$128,401,000	Closure Cost	\$68,369,000
					Years	Annual Cost	Years	Annual Cost								
Capital Construction Cost	1,667,546	\$118	\$196,770,428	\$196,770,000	15 (FY 2007 to FY 2021)		7	\$28,110,000	Total Years	5	Total Years	18	Total Years	26	Total Years	22
Disposal Facility Operational Cost	1,667,546	\$77	\$128,401,042	\$128,401,000	25 (FY 2014 to FY 2032, FY 2038 to FY 2043)		9	\$14,267,000	Total Capital Construction Cost	\$196,770,000	Years of Equal Funding	16	Years of Equal Funding	19	Years of Equal Funding	20
Closure Cost	1,667,546	\$41	\$68,369,386	\$68,369,000	17 (FY 2018 to FY 2032, FY 2043 to FY 2044)		5	\$13,674,000	Total Design % (EE/CA & Design)	15%	Years of Incremental Funding	2	Years of Incremental Funding	7	Years of Incremental Funding	2
Short Term Stewardship					5 (FY 2033 to FY 2037)	\$2,718,000			Total Design Cost	\$29,515,500	Incremental Funding Factor	2	Incremental Funding Factor	1.5	Incremental Funding Factor	2
Post-Closure/Long-Term Stewardship Cost	1,667,546	\$163	\$271,809,998	\$271,810,000	100 (FY 2045 to FY 2144)	\$2,718,000	100	\$2,718,000	EE/CA Cost per Year (20% of Total Design - FY 2007 to FY 2008)	<u>\$2,952,000</u>	Cost per Year for Equal Funding	<u>\$8,363,000</u>	Cost per Year for Equal Funding	<u>\$4,353,000</u>	Cost per Year for Equal Funding	<u>\$2,849,000</u>
									Design Cost per Year (80% of Total Design - FY 2009 to FY 2011)	<u>\$7,871,000</u>	Cost per Year for Incremental Funding	<u>\$16,725,000</u>	Cost per Year for Incremental Funding	<u>\$6,529,000</u>	Cost per Year for Incremental Funding	<u>\$5,697,000</u>

Note

1. Expected high unit costs were selected for capital, operational, closure, and post-closure cost elements.
2. Facilities selected for disposal unit costs and average years of operation: Fernald OSDF, INEEL ICDF, Oak Ridge EMWMF, Weldon Spring.
3. Unit cost (\$/m<sup>3</sup>) is based solely the total volume of waste to be disposed.
4. Construction Cost of \$167,254,500 is design cost minus total capital construction cost (\$196,770,000 - \$29,515,500)
5. Costs are rounded to the nearest \$1,000 during the annual cost calculation for each activity hence a rounding error is been incurred in the total cost for each activity
6. Assumptions used to calculate the annual costs for each activity has been discussed in Section 5.1.

7. The following algebraic equation was used to calculate the annual costs: [(Years of Incremental Funding) x (Factor)] + (Years of Equal Funding) = Total Cost

## Appendix E

### Escalation Rate Data and Discount Rate Data

# Escalation Data

Table E1

Escalation Rate and Index Assumptions For DOE Environmental Management Project									Calculated Escalation Factors					
FY	Index	Rate	FY	Index	Rate	FY	Index	Rate	FY	Factors	FY	Factors	FY	Factors
2006	1.103	2.6	2031	2.009	2.4	2056	3.652	2.4	2006	1.000	2031	1.822	2056	3.311
2007	1.130	2.4	2032	2.058	2.4	2057	3.740	2.4	2007	1.024	2032	1.866	2057	3.391
2008	1.157	2.4	2033	2.108	2.4	2058	3.830	2.4	2008	1.049	2033	1.912	2058	3.473
2009	1.185	2.4	2034	2.159	2.4	2059	3.922	2.4	2009	1.075	2034	1.958	2059	3.556
2010	1.214	2.4	2035	2.211	2.4	2060	4.017	2.4	2010	1.101	2035	2.005	2060	3.642
2011	1.244	2.4	2036	2.265	2.4	2061	4.114	2.4	2011	1.128	2036	2.054	2061	3.730
2012	1.274	2.4	2037	2.320	2.4	2062	4.213	2.4	2012	1.156	2037	2.104	2062	3.820
2013	1.305	2.4	2038	2.376	2.4	2063	4.315	2.4	2013	1.184	2038	2.155	2063	3.913
2014	1.337	2.4	2039	2.434	2.4	2064	4.419	2.4	2014	1.213	2039	2.207	2064	4.007
2015	1.370	2.4	2040	2.493	2.4	2065	4.526	2.4	2015	1.243	2040	2.261	2065	4.104
2016	1.403	2.4	2041	2.553	2.4	2066	4.635	2.4	2016	1.272	2041	2.315	2066	4.203
2017	1.437	2.4	2042	2.615	2.4	2067	4.747	2.4	2017	1.303	2042	2.371	2067	4.304
2018	1.472	2.4	2043	2.678	2.4	2068	4.861	2.4	2018	1.335	2043	2.428	2068	4.408
2019	1.508	2.4	2044	2.743	2.4	2069	4.978	2.4	2019	1.368	2044	2.487	2069	4.514
2020	1.545	2.4	2045	2.809	2.4	2070	5.098	2.4	2020	1.401	2045	2.547	2070	4.622
2021	1.583	2.4	2046	2.877	2.4	2071	5.221	2.4	2021	1.436	2046	2.609	2071	4.734
2022	1.621	2.4	2047	2.947	2.4	2072	5.347	2.4	2022	1.470	2047	2.672	2072	4.848
2023	1.660	2.4	2048	3.018	2.4	2073	5.476	2.4	2023	1.505	2048	2.737	2073	4.965
2024	1.700	2.4	2049	3.091	2.4	2074	5.608	2.4	2024	1.542	2049	2.803	2074	5.085
2025	1.741	2.4	2050	3.166	2.4	2075	5.743	2.4	2025	1.579	2050	2.871	2075	5.207
2026	1.783	2.4	2051	3.242	2.4	2076	5.881	2.4	2026	1.617	2051	2.940	2076	5.332
2027	1.826	2.4	2052	3.320	2.4	2077	6.023	2.4	2027	1.656	2052	3.010	2077	5.461
2028	1.870	2.4	2053	3.400	2.4	2078	6.168	2.4	2028	1.696	2053	3.083	2078	5.593
2029	1.915	2.4	2054	3.482	2.4	2079	6.317	2.4	2029	1.737	2054	3.157	2079	5.728
2030	1.961	2.4	2055	3.566	2.4	2080	6.469	2.4	2030	1.778	2055	3.234	2080	5.865

**Note:**

1. Escalation Index trends were calculated based on a constant rate of 2.4%. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004) , under Environmental Management (EM) Project Category.
2. The constant rate of 2.4% was assumed after the year 2009 onwards.



**APPENDIX C**  
(Revised January 2006)

**DISCOUNT RATES FOR COST-EFFECTIVENESS, LEASE PURCHASE,  
AND RELATED ANALYSES**

**Effective Dates.** This appendix is updated annually around the time of the President's budget submission to Congress. This version of the appendix is valid through the end of January 2007. A copy of the updated appendix can be obtained in electronic form through the OMB home page at [http://www.whitehouse.gov/omb/circulars/a094/a94\\_appx-c.html](http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html), the text of the main body of the Circular is found at <http://www.whitehouse.gov/omb/circulars/a094/a094.html>, and a table of past years' rates is located at <http://www.whitehouse.gov/omb/circulars/a094/dischist-2006.pdf>. Updates of the appendix are also available upon request from OMB's Office of Economic Policy (202-395-3381).

**Nominal Discount Rates.** A forecast of nominal or market interest rates for 2006 based on the economic assumptions from the 2007 Budget are presented below. These nominal rates are to be used for discounting nominal flows, which are often encountered in lease-purchase analysis.

**Nominal Interest Rates on Treasury Notes and Bonds  
of Specified Maturities (in percent)**

<u>3-Year</u>	<u>5-Year</u>	<u>7-Year</u>	<u>10-Year</u>	<u>20-Year</u>	<u>30-Year</u>
4.7	4.8	4.9	5.0	5.3	5.2

**Real Discount Rates.** A forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions from the 2007 Budget is presented below. These real rates are to be used for discounting real (constant-dollar) flows, as often required in cost-effectiveness analysis.

**Real Interest Rates on Treasury Notes and Bonds  
of Specified Maturities (in percent)**

<u>3-Year</u>	<u>5-Year</u>	<u>7-Year</u>	<u>10-Year</u>	<u>20-Year</u>	<u>30-Year</u>
2.5	2.6	2.7	2.8	3.0	3.0

Analyses of programs with terms different from those presented above may use a linear interpolation. For example, a four-year project can be evaluated with a rate equal to the average of the three-year and five-year rates. Programs with durations longer than 30 years may use the 30-year interest rate.

# Discount Factor, 30 Years: 5.2%

Table E3

Time Years	Year	Discount Factor
1	FY 2007	0.9505
2	FY 2008	0.9035
3	FY 2009	0.8589
4	FY 2010	0.8164
5	FY 2011	0.7761
6	FY 2012	0.7377
7	FY 2013	0.7012
8	FY 2014	0.6666
9	FY 2015	0.6336
10	FY 2016	0.6023
11	FY 2017	0.5725
12	FY 2018	0.5442
13	FY 2019	0.5173
14	FY 2020	0.4917
15	FY 2021	0.4674
16	FY 2022	0.4443
17	FY 2023	0.4224
18	FY 2024	0.4015
19	FY 2025	0.3816
20	FY 2026	0.3628
21	FY 2027	0.3448
22	FY 2028	0.3278
23	FY 2029	0.3116
24	FY 2030	0.2962
25	FY 2031	0.2815
26	FY 2032	0.2676
27	FY 2033	0.2544
28	FY 2034	0.2418
29	FY 2035	0.2299
30	FY 2036	0.2185
31	FY 2037	0.2077
32	FY 2038	0.1974
33	FY 2039	0.1877
34	FY 2040	0.1784
35	FY 2041	0.1696

Time Years	Year	Discount Factor
36	FY 2042	0.1612
37	FY 2043	0.1532
38	FY 2044	0.1456
39	FY 2045	0.1384
40	FY 2046	0.1316
41	FY 2047	0.1251
42	FY 2048	0.1189
43	FY 2049	0.1130
44	FY 2050	0.1074
45	FY 2051	0.1021
46	FY 2052	0.0971
47	FY 2053	0.0923
48	FY 2054	0.0877
49	FY 2055	0.0834
50	FY 2056	0.0792
51	FY 2057	0.0753
52	FY 2058	0.0716
53	FY 2059	0.0681
54	FY 2060	0.0647
55	FY 2061	0.0615
56	FY 2062	0.0584
57	FY 2063	0.0556
58	FY 2064	0.0528
59	FY 2065	0.0502
60	FY 2066	0.0477
61	FY 2067	0.0453
62	FY 2068	0.0431
63	FY 2069	0.0410
64	FY 2070	0.0389
65	FY 2071	0.0370
66	FY 2072	0.0352
67	FY 2073	0.0334
68	FY 2074	0.0318
69	FY 2075	0.03026
70	FY 2076	0.02876

Time Years	Year	Discount Factor
71	FY 2077	0.02734
72	FY 2078	0.02599
73	FY 2079	0.02470
74	FY 2080	0.02348
75	FY 2081	0.02232
76	FY 2082	0.02122
77	FY 2083	0.02017
78	FY 2084	0.01917
79	FY 2085	0.01822
80	FY 2086	0.01732
81	FY 2087	0.01647
82	FY 2088	0.01565
83	FY 2089	0.01488
84	FY 2090	0.01414
85	FY 2091	0.01344
86	FY 2092	0.01278
87	FY 2093	0.01215
88	FY 2094	0.01155
89	FY 2095	0.01097
90	FY 2096	0.01043
91	FY 2097	0.00992
92	FY 2098	0.00943
93	FY 2099	0.00896
94	FY 2100	0.00852
95	FY 2101	0.00810
96	FY 2102	0.00769
97	FY 2103	0.00731
98	FY 2104	0.00695
99	FY 2105	0.00661
100	FY 2106	0.00628
101	FY 2107	0.00597
102	FY 2108	0.00568
103	FY 2109	0.005399
104	FY 2110	0.005132
105	FY 2111	0.004879

**Source:** Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent)

## Appendix F

### Annualized Cost Estimates for Scenario I (Current, Life-Cycle, and Present Value Costs)

SCENARIO I (Prompt D&D) - TABLE F1

Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility															COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m <sup>3</sup> of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																						
Location:	Portsmouth, OH																							
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																							
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																						
Base Year:	4 <sup>th</sup> Quarter, FY 2006																							
Date:	August 2006																							
CURRENT COSTS IN DOLLARS																								
Cost Category ID	Cost Category Description	Fiscal Year																						
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026			
2A	Capital Construction Cost	\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$11,330,000	\$11,330,000	\$11,330,000	\$11,330,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$0			
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$9,767,000	\$9,767,000			
3	Total Project Cost (without Contingency)	\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$26,535,000	\$26,535,000	\$26,535,000	\$26,535,000	\$27,642,000	\$27,642,000	\$27,642,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$17,320,000	\$9,767,000			
4	Contingency 20% (DOE-Held)	\$3,542,000	\$2,361,000	\$6,082,000	\$6,082,000	\$5,307,000	\$5,307,000	\$5,307,000	\$5,307,000	\$5,528,000	\$5,528,000	\$5,528,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$3,464,000	\$1,953,000			
5	Total Project Cost (TPC)	\$21,251,000	\$14,167,000	\$36,492,000	\$36,492,000	\$31,842,000	\$31,842,000	\$31,842,000	\$31,842,000	\$33,170,000	\$33,170,000	\$33,170,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$20,784,000	\$11,720,000			
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (CURRENT DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule.  <b>2A:</b> The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities.  <b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).  <b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements.  Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D1, Appendix D. Costs are rounded to the nearest \$1,000.														
	\$393,547,000	\$472,252,000			<table><tr><td>(-) 30%</td><td>\$330,576,000</td></tr><tr><td>TPC</td><td>\$472,252,000</td></tr><tr><td>(+) 50%</td><td>\$708,378,000</td></tr></table>																		(-) 30%	\$330,576,000
(-) 30%	\$330,576,000																							
TPC	\$472,252,000																							
(+) 50%	\$708,378,000																							

SCENARIO I (Prompt D&D) - TABLE F2																					
Life-Cycle Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY			
Site:	On-Site Waste Disposal Facility	<p>The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&amp;D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.</p> <p>Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&amp;D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&amp;D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&amp;C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.</p>																			
Location:	Portsmouth, OH																				
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																				
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																				
Base Year:	4 <sup>th</sup> Quarter, FY 2006																				
Date:	August 2006																				
LIFE-CYCLE COSTS IN DOLLARS																					
Cost Category ID	Cost Category Description	Fiscal Year																			
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2A	Capital Construction Cost	\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$17,151,000	\$17,577,000	\$18,003,000	\$18,444,000	\$18,900,000	\$19,341,000	\$19,812,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$12,780,000	\$13,097,000	\$13,415,000	\$13,743,000	\$9,388,000	\$9,607,000	\$9,842,000	\$10,083,000	\$10,333,000	\$10,582,000	\$10,846,000	\$11,103,000	\$11,367,000	\$11,647,000	\$11,926,000	\$0
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,071,000	\$6,212,000	\$6,364,000	\$6,520,000	\$6,681,000	\$6,842,000	\$7,013,000	\$7,179,000	\$7,350,000	\$7,531,000	\$15,422,000	\$15,793,000
3	Total Project Cost (Escalated without Contingency)	\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$29,931,000	\$30,674,000	\$31,418,000	\$32,187,000	\$34,359,000	\$35,160,000	\$36,018,000	\$16,603,000	\$17,014,000	\$17,424,000	\$17,859,000	\$18,282,000	\$18,717,000	\$19,178,000	\$27,348,000	\$15,793,000
4	Contingency 20% (DOE-Held)	\$3,627,000	\$2,477,000	\$6,538,000	\$6,696,000	\$5,986,000	\$6,135,000	\$6,284,000	\$6,437,000	\$6,872,000	\$7,032,000	\$7,204,000	\$3,321,000	\$3,403,000	\$3,485,000	\$3,572,000	\$3,656,000	\$3,743,000	\$3,836,000	\$5,470,000	\$3,159,000
5	Total Project Cost (Escalated)	\$21,761,000	\$14,861,000	\$39,229,000	\$40,177,000	\$35,917,000	\$36,809,000	\$37,702,000	\$38,624,000	\$41,231,000	\$42,192,000	\$43,222,000	\$19,924,000	\$20,417,000	\$20,909,000	\$21,431,000	\$21,938,000	\$22,460,000	\$23,014,000	\$32,818,000	\$18,952,000
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (LIFE CYCLE DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)				<p><b>NOTES:</b></p> <p>This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC.</p> <p>The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&amp;D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&amp;D schedule.</p> <p><b>2A:</b> The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities.</p> <p><b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).</p> <p><b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements.</p> <p>Escalation Index was calculated based on a constant rate of 2.4% after FY 08. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004), under Environmental Management (EM) Project Category. See Table E1, Appendix E.</p> <p>Life-cycle dollars are escalated from current costs from Table F1.</p> <p>Costs are rounded to the nearest \$1,000.</p> <p>Disposal activity schedules are presented in Table 5-3, Section 5.1.</p> <p>Annual costs for each disposal activity were calculated are presented in Table D1, Appendix D.</p>												
	\$494,655,000	\$593,588,000			<table><tr><td>(-) 30%</td><td>\$415,512,000</td></tr><tr><td>TPC</td><td>\$593,588,000</td></tr><tr><td>(+) 50%</td><td>\$890,382,000</td></tr></table>																
(-) 30%	\$415,512,000																				
TPC	\$593,588,000																				
(+) 50%	\$890,382,000																				

SCENARIO I (Prompt D&D) - TABLE F3

Present Value Analysis for On-Site Waste Disposal Facility

COST ESTIMATE SUMMARY

Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.
Location:	Portsmouth, OH	
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]	
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	
Base Year:	4 <sup>th</sup> Quarter, FY 2006	Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.
Date:	August 2006	

PRESENT VALUE COSTS IN DOLLARS

Cost Category ID	Cost Category Description	Fiscal Year																				
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	
2A	Capital Construction Cost	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$13,311,000	\$12,967,000	\$12,624,000	\$12,295,000	\$11,975,000	\$11,649,000	\$11,342,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$9,919,000	\$9,662,000	\$9,407,000	\$9,161,000	\$5,948,000	\$5,786,000	\$5,635,000	\$5,487,000	\$5,345,000	\$5,203,000	\$5,069,000	\$4,933,000	\$4,801,000	\$4,676,000	\$4,551,000	\$0	
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,847,000	\$3,741,000	\$3,643,000	\$3,548,000	\$3,456,000	\$3,364,000	\$3,278,000	\$3,190,000	\$3,105,000	\$3,024,000	\$5,885,000	\$5,730,000	
3	Total Project Cost (without Contingency)	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$23,230,000	\$22,629,000	\$22,031,000	\$21,456,000	\$21,770,000	\$21,176,000	\$20,620,000	\$9,035,000	\$8,801,000	\$8,567,000	\$8,347,000	\$8,123,000	\$7,906,000	\$7,700,000	\$10,436,000	\$5,730,000	
4	Contingency 20% (DOE-Held)	\$3,447,000	\$2,238,000	\$5,616,000	\$5,467,000	\$4,646,000	\$4,526,000	\$4,406,000	\$4,291,000	\$4,354,000	\$4,235,000	\$4,124,000	\$1,807,000	\$1,760,000	\$1,713,000	\$1,669,000	\$1,625,000	\$1,581,000	\$1,540,000	\$2,087,000	\$1,146,000	
5	Total Project Cost (Present Value)	\$20,683,000	\$13,427,000	\$33,694,000	\$32,801,000	\$27,876,000	\$27,155,000	\$26,437,000	\$25,747,000	\$26,124,000	\$25,411,000	\$24,744,000	\$10,842,000	\$10,561,000	\$10,280,000	\$10,016,000	\$9,748,000	\$9,487,000	\$9,240,000	\$12,523,000	\$6,876,000	
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (PRESENT VALUE DOLLARS) SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Discount Rate of 5.2% was used to determine present value costs per Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent). See Table E3, Appendix E. Present value dollars are discounted from life-cycle costs from Table F2. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D1, Appendix D.												
	\$311,394,000	\$373,672,000			<table><tr><td>(-) 30%</td><td>\$261,570,000</td></tr><tr><td>TPC</td><td>\$373,672,000</td></tr><tr><td>(+) 50%</td><td>\$560,508,000</td></tr></table>																	
(-) 30%	\$261,570,000																					
TPC	\$373,672,000																					
(+) 50%	\$560,508,000																					

## Appendix G

### Annualized Cost Estimates for Scenario II (Current, Life-Cycle, and Present Value Costs)

SCENARIO II (Two Phase D&D) - TABLE G1																											
Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility	<p>The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&amp;D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.</p> <p>Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&amp;D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&amp;D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&amp;C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.</p>																									
Location:	Portsmouth, OH																										
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																										
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																										
Base Year:	4 <sup>th</sup> Quarter, FY 2006																										
Date:	August 2006																										
CURRENT COSTS IN DOLLARS																											
Cost Category ID	Cost Category Description	Fiscal Year																									
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026						
2A	Capital Construction Cost	\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$9,171,000	\$9,171,000	\$9,171,000	\$9,171,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$0	\$0						
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$0	\$0						
2E	Short Term Stewardship	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,718,000	\$2,718,000						
3	Total Project Cost (without Contingency)	\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$24,376,000	\$24,376,000	\$24,376,000	\$24,376,000	\$26,203,000	\$26,203,000	\$26,203,000	\$10,998,000	\$10,998,000	\$10,998,000	\$10,998,000	\$10,998,000	\$10,998,000	\$10,998,000	\$2,718,000	\$2,718,000						
4	Contingency 20% (DOE-Held)	\$3,542,000	\$2,361,000	\$6,082,000	\$6,082,000	\$4,875,000	\$4,875,000	\$4,875,000	\$4,875,000	\$5,241,000	\$5,241,000	\$5,241,000	\$2,200,000	\$2,200,000	\$2,200,000	\$2,200,000	\$2,200,000	\$2,200,000	\$2,200,000	\$544,000	\$544,000						
5	Total Project Cost (TPC)	\$21,251,000	\$14,167,000	\$36,492,000	\$36,492,000	\$29,251,000	\$29,251,000	\$29,251,000	\$29,251,000	\$31,444,000	\$31,444,000	\$31,444,000	\$13,198,000	\$13,198,000	\$13,198,000	\$13,198,000	\$13,198,000	\$13,198,000	\$13,198,000	\$3,262,000	\$3,262,000						
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044								
2A	Capital Construction Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0								
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$0								
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$9,767,000	\$9,767,000								
2E	Short Term Stewardship	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$0	\$0	\$0	\$0	\$0	\$0								
3	Total Project Cost (without Contingency)	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$2,718,000	\$6,114,000	\$6,114,000	\$6,114,000	\$6,114,000	\$15,881,000	\$9,767,000								
4	Contingency 20% (DOE-Held)	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$544,000	\$1,223,000	\$1,223,000	\$1,223,000	\$1,223,000	\$3,176,000	\$1,953,000								
5	Total Project Cost (TPC)	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$3,262,000	\$7,337,000	\$7,337,000	\$7,337,000	\$7,337,000	\$19,057,000	\$11,720,000								
TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3		TPC (CURRENT DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					NOTES: This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. 2E: Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during the delay between Phase 1 and Phase 2 D&D activities. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D2, Appendix D. Costs are rounded to the nearest \$1000.																	
\$431,590,000		\$517,917,000			<table><tr><td>(-) 30%</td><td>\$362,542,000</td></tr><tr><td>TPC</td><td>\$517,917,000</td></tr><tr><td>(+) 50%</td><td>\$776,876,000</td></tr></table>					(-) 30%	\$362,542,000	TPC	\$517,917,000	(+) 50%	\$776,876,000												
(-) 30%	\$362,542,000																										
TPC	\$517,917,000																										
(+) 50%	\$776,876,000																										



SCENARIO II (Two Phase D&D) - TABLE G2																												
Life-Cycle Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY										
Site:	On-Site Waste Disposal Facility	<p>The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&amp;D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.</p> <p>Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&amp;D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&amp;D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&amp;C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.</p>																										
Location:	Portsmouth, OH																											
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																											
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																											
Base Year:	4 <sup>th</sup> Quarter, FY 2006																											
Date:	August 2006																											
LIFE-CYCLE COSTS IN DOLLARS																												
Cost Category ID	Cost Category Description	Fiscal Year																										
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026							
2A	Capital Construction Cost	\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$17,151,000	\$17,577,000	\$18,003,000	\$18,444,000	\$18,900,000	\$19,341,000	\$19,812,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0							
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$10,345,000	\$10,602,000	\$10,858,000	\$11,124,000	\$7,600,000	\$7,777,000	\$7,967,000	\$8,162,000	\$8,364,000	\$8,566,000	\$8,780,000	\$8,988,000	\$9,202,000	\$9,428,000	\$0	\$0							
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,071,000	\$6,212,000	\$6,364,000	\$6,520,000	\$6,681,000	\$6,842,000	\$7,013,000	\$7,179,000	\$7,350,000	\$7,531,000	\$0	\$0							
2E	Short Term Stewardship	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,292,000	\$4,395,000							
3	Total Project Cost (Escalated without Contingency)	\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$27,496,000	\$28,179,000	\$28,861,000	\$29,568,000	\$32,571,000	\$33,330,000	\$34,143,000	\$14,682,000	\$15,045,000	\$15,408,000	\$15,793,000	\$16,167,000	\$16,552,000	\$16,959,000	\$4,292,000	\$4,395,000							
4	Contingency 20% (DOE-Held)	\$3,627,000	\$2,477,000	\$6,538,000	\$6,696,000	\$5,499,000	\$5,636,000	\$5,772,000	\$5,914,000	\$6,514,000	\$6,666,000	\$6,829,000	\$2,936,000	\$3,009,000	\$3,082,000	\$3,159,000	\$3,233,000	\$3,310,000	\$3,392,000	\$858,000	\$879,000							
5	Total Project Cost (Escalated)	\$21,761,000	\$14,861,000	\$39,229,000	\$40,177,000	\$32,995,000	\$33,815,000	\$34,633,000	\$35,482,000	\$39,085,000	\$39,996,000	\$40,972,000	\$17,618,000	\$18,054,000	\$18,490,000	\$18,952,000	\$19,400,000	\$19,862,000	\$20,351,000	\$5,150,000	\$5,274,000							
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044									
2A	Capital Construction Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0									
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$13,494,000	\$13,824,000	\$14,154,000	\$14,496,000	\$14,845,000	\$0									
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$23,714,000	\$24,291,000									
2E	Short Term Stewardship	\$4,501,000	\$4,610,000	\$4,721,000	\$4,833,000	\$4,952,000	\$5,072,000	\$5,197,000	\$5,322,000	\$5,450,000	\$5,583,000	\$5,719,000	\$5,857,000	\$0	\$0	\$0	\$0	\$0	\$0									
3	Total Project Cost (Escalated without Contingency)	\$4,501,000	\$4,610,000	\$4,721,000	\$4,833,000	\$4,952,000	\$5,072,000	\$5,197,000	\$5,322,000	\$5,450,000	\$5,583,000	\$5,719,000	\$5,857,000	\$13,494,000	\$13,824,000	\$14,154,000	\$14,496,000	\$38,559,000	\$24,291,000									
4	Contingency 20% (DOE-Held)	\$900,000	\$922,000	\$944,000	\$967,000	\$990,000	\$1,014,000	\$1,039,000	\$1,064,000	\$1,090,000	\$1,117,000	\$1,144,000	\$1,171,000	\$2,699,000	\$2,765,000	\$2,831,000	\$2,899,000	\$7,712,000	\$4,858,000									
5	Total Project Cost (Escalated)	\$5,401,000	\$5,532,000	\$5,665,000	\$5,800,000	\$5,942,000	\$6,086,000	\$6,236,000	\$6,386,000	\$6,540,000	\$6,700,000	\$6,863,000	\$7,028,000	\$16,193,000	\$16,589,000	\$16,985,000	\$17,395,000	\$46,271,000	\$29,149,000									
TPC (WITHOUT CONTINGENCY)		TPC (LIFE-CYCLE DOLLARS)			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. <b>2A:</b> The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. <b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). <b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. <b>2E:</b> Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during the delay between Phase 1 and Phase 2 D&D activities.  Escalation Index was calculated based on a constant rate of 2.4% after FY 08. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004), under Environmental Management (EM) Project Category.  Life-cycle dollars are escalated from current costs from Table F1.  Costs are rounded to the nearest \$1,000.  Disposal activity schedules are presented in Table 5-3, Section 5.1.  Annual costs for each disposal activity were calculated are presented in Table D2, Appendix D.																		
\$610,766,000		\$732,918,000			<table><tr><td>(-) 30%</td><td>\$513,043,000</td></tr><tr><td>TPC</td><td>\$732,918,000</td></tr><tr><td>(+) 50%</td><td>\$1,099,377,000</td></tr></table>					(-) 30%	\$513,043,000	TPC	\$732,918,000	(+) 50%	\$1,099,377,000													
(-) 30%	\$513,043,000																											
TPC	\$732,918,000																											
(+) 50%	\$1,099,377,000																											

SCENARIO II (Two Phase D&D) - TABLE G3																											
Present Value Analysis for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility			The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																							
Location:	Portsmouth, OH																										
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																										
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																										
Base Year:	4 <sup>th</sup> Quarter, FY 2006			Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																							
Date:	August 2006																										
PRESENT VALUE COSTS IN DOLLARS																											
Cost Category ID	Cost Category Description	Fiscal Year																									
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026						
2A	Capital Construction Cost	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$13,311,000	\$12,967,000	\$12,624,000	\$12,295,000	\$11,975,000	\$11,649,000	\$11,342,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$8,029,000	\$7,821,000	\$7,614,000	\$7,415,000	\$4,815,000	\$4,684,000	\$4,561,000	\$4,442,000	\$4,327,000	\$4,212,000	\$4,104,000	\$3,993,000	\$3,887,000	\$3,785,000	\$0	\$0						
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,847,000	\$3,741,000	\$3,643,000	\$3,548,000	\$3,456,000	\$3,364,000	\$3,278,000	\$3,190,000	\$3,105,000	\$3,024,000	\$0	\$0						
2E	Short Term Stewardship	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,638,000	\$1,595,000						
3	Total Project Cost (without Contingency)	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$21,340,000	\$20,788,000	\$20,238,000	\$19,710,000	\$20,637,000	\$20,074,000	\$19,546,000	\$7,990,000	\$7,783,000	\$7,576,000	\$7,382,000	\$7,183,000	\$6,992,000	\$6,809,000	\$1,638,000	\$1,595,000						
4	Contingency 20% (DOE-Held)	\$3,447,000	\$2,238,000	\$5,616,000	\$5,467,000	\$4,268,000	\$4,158,000	\$4,048,000	\$3,942,000	\$4,127,000	\$4,015,000	\$3,909,000	\$1,598,000	\$1,557,000	\$1,515,000	\$1,476,000	\$1,437,000	\$1,398,000	\$1,362,000	\$328,000	\$319,000						
5	Total Project Cost (Present Value)	\$20,683,000	\$13,427,000	\$33,694,000	\$32,801,000	\$25,608,000	\$24,946,000	\$24,286,000	\$23,652,000	\$24,764,000	\$24,089,000	\$23,455,000	\$9,588,000	\$9,340,000	\$9,091,000	\$8,858,000	\$8,620,000	\$8,390,000	\$8,171,000	\$1,966,000	\$1,914,000						
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044								
2A	Capital Construction Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0								
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,533,000	\$2,466,000	\$2,401,000	\$2,337,000	\$2,274,000	\$0								
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,633,000	\$3,537,000								
2E	Short Term Stewardship	\$1,552,000	\$1,511,000	\$1,471,000	\$1,432,000	\$1,394,000	\$1,357,000	\$1,322,000	\$1,287,000	\$1,253,000	\$1,220,000	\$1,188,000	\$1,156,000	\$0	\$0	\$0	\$0	\$0	\$0								
3	Total Project Cost (without Contingency)	\$1,552,000	\$1,511,000	\$1,471,000	\$1,432,000	\$1,394,000	\$1,357,000	\$1,322,000	\$1,287,000	\$1,253,000	\$1,220,000	\$1,188,000	\$1,156,000	\$2,533,000	\$2,466,000	\$2,401,000	\$2,337,000	\$5,907,000	\$3,537,000								
4	Contingency 20% (DOE-Held)	\$310,000	\$302,000	\$294,000	\$286,000	\$279,000	\$271,000	\$264,000	\$257,000	\$251,000	\$244,000	\$238,000	\$231,000	\$507,000	\$493,000	\$480,000	\$467,000	\$1,181,000	\$707,000								
5	Total Project Cost (Present Value)	\$1,862,000	\$1,813,000	\$1,765,000	\$1,718,000	\$1,673,000	\$1,628,000	\$1,586,000	\$1,544,000	\$1,504,000	\$1,464,000	\$1,426,000	\$1,387,000	\$3,040,000	\$2,959,000	\$2,881,000	\$2,804,000	\$7,088,000	\$4,244,000								
TPC (WITHOUT CONTINGENCY)		TPC (PRESENT VALUE DOLLARS)			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					NOTES: This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. 2E: Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during the delay between Phase 1 and Phase 2 D&D activities. Discount Rate of 5.2% was used to determine present value costs per Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent). See Table E3, Appendix E. Present value dollars are discounted from life-cycle costs from Table F2. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D2, Appendix D.																	
\$316,442,000		\$379,729,000			<table><tr><td>(-) 30%</td><td>\$265,810,000</td></tr><tr><td>TPC</td><td>\$379,729,000</td></tr><tr><td>(+) 50%</td><td>\$569,594,000</td></tr></table>					(-) 30%	\$265,810,000	TPC	\$379,729,000	(+) 50%	\$569,594,000												
(-) 30%	\$265,810,000																										
TPC	\$379,729,000																										
(+) 50%	\$569,594,000																										

## Appendix H

### Annualized Cost Estimates for Scenario IV (Current, Life-Cycle, and Present Value Costs)

SCENARIO IV (Prompt D&D with Size Reduction) - TABLE H1																										
Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY								
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																								
Location:	Portsmouth, OH																									
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																									
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																								
Base Year:	4 <sup>th</sup> Quarter, FY 2006																									
Date:	August 2006																									
CURRENT COSTS IN DOLLARS																										
Cost Category ID	Cost Category Description	Fiscal Year																								
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025						
2A	Capital Construction Cost	\$16,861,000	\$11,241,000	\$28,953,000	\$28,953,000	\$14,477,000	\$14,477,000	\$14,477,000	\$14,477,000	\$14,477,000	\$14,477,000	\$14,477,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$11,461,000	\$11,461,000	\$11,461,000	\$11,461,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$7,641,000	\$0						
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$5,007,000	\$10,015,000	\$10,015,000						
3	Total Project Cost (without Contingency)	\$16,861,000	\$11,241,000	\$28,953,000	\$28,953,000	\$25,938,000	\$25,938,000	\$25,938,000	\$25,938,000	\$27,125,000	\$27,125,000	\$27,125,000	\$12,648,000	\$12,648,000	\$12,648,000	\$12,648,000	\$12,648,000	\$12,648,000	\$17,656,000	\$10,015,000						
4	Contingency 20% (DOE-Held)	\$3,372,000	\$2,248,000	\$5,791,000	\$5,791,000	\$5,188,000	\$5,188,000	\$5,188,000	\$5,188,000	\$5,425,000	\$5,425,000	\$5,425,000	\$2,530,000	\$2,530,000	\$2,530,000	\$2,530,000	\$2,530,000	\$2,530,000	\$3,531,000	\$2,003,000						
5	Total Project Cost (TPC)	\$20,233,000	\$13,489,000	\$34,744,000	\$34,744,000	\$31,126,000	\$31,126,000	\$31,126,000	\$31,126,000	\$32,550,000	\$32,550,000	\$32,550,000	\$15,178,000	\$15,178,000	\$15,178,000	\$15,178,000	\$15,178,000	\$15,178,000	\$21,187,000	\$12,018,000						
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (CURRENT DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					NOTES: This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D3, Appendix D. Costs are rounded to the nearest \$1,000.																
	\$374,694,000	\$449,637,000			<table><tr><td>(-) 30%</td><td>\$314,746,000</td></tr><tr><td>TPC</td><td>\$449,637,000</td></tr><tr><td>(+) 50%</td><td>\$674,456,000</td></tr></table>					(-) 30%	\$314,746,000	TPC	\$449,637,000	(+) 50%	\$674,456,000											
(-) 30%	\$314,746,000																									
TPC	\$449,637,000																									
(+) 50%	\$674,456,000																									

SCENARIO IV (Prompt D&D with Size Reduction) - TABLE H2																				
Life-Cycle Cost Estimate for On-Site Waste Disposal Facility															COST ESTIMATE SUMMARY					
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																		
Location:	Portsmouth, OH																			
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																			
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																		
Base Year:	4 <sup>th</sup> Quarter, FY 2006																			
Date:	August 2006																			
LIFE-CYCLE COSTS IN DOLLARS																				
Cost Category ID	Cost Category Description	Fiscal Year																		
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2A	Capital Construction Cost	\$17,266,000	\$11,792,000	\$31,124,000	\$31,877,000	\$16,330,000	\$16,735,000	\$17,141,000	\$17,561,000	\$17,995,000	\$18,415,000	\$18,864,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$12,928,000	\$13,249,000	\$13,570,000	\$13,902,000	\$9,498,000	\$9,719,000	\$9,956,000	\$10,201,000	\$10,453,000	\$10,705,000	\$10,972,000	\$11,232,000	\$11,500,000	\$11,782,000	\$0
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,224,000	\$6,369,000	\$6,524,000	\$6,684,000	\$6,850,000	\$7,015,000	\$7,190,000	\$7,360,000	\$7,536,000	\$15,443,000	\$15,814,000
3	Total Project Cost (Escalated without Contingency)	\$17,266,000	\$11,792,000	\$31,124,000	\$31,877,000	\$29,258,000	\$29,984,000	\$30,711,000	\$31,463,000	\$33,717,000	\$34,503,000	\$35,344,000	\$16,885,000	\$17,303,000	\$17,720,000	\$18,162,000	\$18,592,000	\$19,036,000	\$27,225,000	\$15,814,000
4	Contingency 20% (DOE-Held)	\$3,453,000	\$2,358,000	\$6,225,000	\$6,375,000	\$5,852,000	\$5,997,000	\$6,142,000	\$6,293,000	\$6,743,000	\$6,901,000	\$7,069,000	\$3,377,000	\$3,461,000	\$3,544,000	\$3,632,000	\$3,718,000	\$3,807,000	\$5,445,000	\$3,163,000
5	Total Project Cost (Escalated)	\$20,719,000	\$14,150,000	\$37,349,000	\$38,252,000	\$35,110,000	\$35,981,000	\$36,853,000	\$37,756,000	\$40,460,000	\$41,404,000	\$42,413,000	\$20,262,000	\$20,764,000	\$21,264,000	\$21,794,000	\$22,310,000	\$22,843,000	\$32,670,000	\$18,977,000
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (LIFE CYCLE DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. <b>2A:</b> The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. <b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). <b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Costs are rounded to the nearest \$1000. Escalation Index was calculated based on a constant rate of 2.4% after FY 08. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004), under Environmental Management (EM) Project Category. See Table E1, Appendix E. Life-cycle dollars are escalated from current costs from Table F1. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D3, Appendix D.										
	\$467,776,000	\$561,331,000			<table><tr><td>(-) 30%</td><td>\$392,932,000</td></tr><tr><td>TPC</td><td>\$561,331,000</td></tr><tr><td>(+) 50%</td><td>\$841,997,000</td></tr></table>															
(-) 30%	\$392,932,000																			
TPC	\$561,331,000																			
(+) 50%	\$841,997,000																			

Present Value Analysis for On-Site Waste Disposal Facility																	COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																								
Location:	Portsmouth, OH																									
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																									
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																								
Base Year:	4 <sup>th</sup> Quarter, FY 2006																									
Date:	August 2006																									
PRESENT VALUE COSTS IN DOLLARS																										
Cost Category ID	Cost Category Description	Fiscal Year																								
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025						
2A	Capital Construction Cost	\$16,411,000	\$10,654,000	\$26,732,000	\$26,024,000	\$12,674,000	\$12,345,000	\$12,019,000	\$11,706,000	\$11,402,000	\$11,091,000	\$10,800,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$10,033,000	\$9,774,000	\$9,515,000	\$9,267,000	\$6,018,000	\$5,854,000	\$5,700,000	\$5,551,000	\$5,407,000	\$5,264,000	\$5,128,000	\$4,990,000	\$4,858,000	\$4,730,000	\$0						
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,944,000	\$3,836,000	\$3,735,000	\$3,637,000	\$3,544,000	\$3,449,000	\$3,361,000	\$3,270,000	\$3,183,000	\$6,200,000	\$6,035,000						
3	Total Project Cost (without Contingency)	\$16,411,000	\$10,654,000	\$26,732,000	\$26,024,000	\$22,707,000	\$22,119,000	\$21,534,000	\$20,973,000	\$21,364,000	\$20,781,000	\$20,235,000	\$9,188,000	\$8,951,000	\$8,713,000	\$8,489,000	\$8,260,000	\$8,041,000	\$10,930,000	\$6,035,000						
4	Contingency 20% (DOE-Held)	\$3,282,000	\$2,131,000	\$5,346,000	\$5,205,000	\$4,541,000	\$4,424,000	\$4,307,000	\$4,195,000	\$4,273,000	\$4,156,000	\$4,047,000	\$1,838,000	\$1,790,000	\$1,743,000	\$1,698,000	\$1,652,000	\$1,608,000	\$2,186,000	\$1,207,000						
5	Total Project Cost (Present Value)	\$19,693,000	\$12,785,000	\$32,078,000	\$31,229,000	\$27,248,000	\$26,543,000	\$25,841,000	\$25,168,000	\$25,637,000	\$24,937,000	\$24,282,000	\$11,026,000	\$10,741,000	\$10,456,000	\$10,187,000	\$9,912,000	\$9,649,000	\$13,116,000	\$7,242,000						
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (PRESENT VALUE DOLLARS) SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule.  2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities.  2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).  2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Discount Rate of 5.2% was used to determine present value costs per Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent). See Table E3, Appendix E. Present value dollars are discounted from life-cycle costs from Table F2. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D3, Appendix D.																
	\$298,141,000	\$357,770,000			<table><tr><td>(-) 30%</td><td>\$250,439,000</td></tr><tr><td>TPC</td><td>\$357,770,000</td></tr><tr><td>(+) 50%</td><td>\$536,655,000</td></tr></table>																(-) 30%	\$250,439,000	TPC	\$357,770,000	(+) 50%	\$536,655,000
(-) 30%																					\$250,439,000					
TPC	\$357,770,000																									
(+) 50%	\$536,655,000																									

## Appendix I

### Annualized Cost Estimates for Scenario VI (Current, Life-Cycle, and Present Value Costs)

SCENARIO VI (Prompt D&D Under RCRA) - TABLE I1

Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility															COST ESTIMATE SUMMARY									
Site:		On-Site Waste Disposal Facility			The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																			
Location:		Portsmouth, OH																						
Phase:		Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																						
Classification:		Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																						
Base Year:		4 <sup>th</sup> Quarter, FY 2006			Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																			
Date:		August 2006																						
CURRENT COSTS IN DOLLARS																								
Cost Category ID		Cost Category Description			Fiscal Year																			
2		Disposal Costs			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2A		Capital Construction Cost			\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$15,205,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B		Disposal Facility Operational Cost			\$0	\$0	\$0	\$0	\$11,330,000	\$11,330,000	\$11,330,000	\$11,330,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$7,553,000	\$0
2C		Closure Cost			\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$4,884,000	\$9,767,000	\$9,767,000
3		Total Project Cost (without Contingency)			\$17,709,000	\$11,806,000	\$30,410,000	\$30,410,000	\$26,535,000	\$26,535,000	\$26,535,000	\$26,535,000	\$27,642,000	\$27,642,000	\$27,642,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$12,437,000	\$17,320,000	\$9,767,000
4		Contingency 20% (DOE-Held)			\$3,542,000	\$2,361,000	\$6,082,000	\$6,082,000	\$5,307,000	\$5,307,000	\$5,307,000	\$5,307,000	\$5,528,000	\$5,528,000	\$5,528,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$2,487,000	\$3,464,000	\$1,953,000
5		Total Project Cost (TPC)			\$21,251,000	\$14,167,000	\$36,492,000	\$36,492,000	\$31,842,000	\$31,842,000	\$31,842,000	\$31,842,000	\$33,170,000	\$33,170,000	\$33,170,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$14,924,000	\$20,784,000	\$11,720,000
		TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3			TPC (CURRENT DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule.  2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities.  2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).  2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements.  Disposal activity schedules are presented in Table 5-3, Section 5.1.  Annual costs for each disposal activity were calculated are presented in Table D4, Appendix D.  Costs are rounded to the nearest \$1,000.											
		\$393,547,000			\$472,252,000			<table><tr><td>(-) 30%</td><td>\$330,576,000</td></tr><tr><td>TPC</td><td>\$472,252,000</td></tr><tr><td>(+) 50%</td><td>\$708,378,000</td></tr></table>																
(-) 30%	\$330,576,000																							
TPC	\$472,252,000																							
(+) 50%	\$708,378,000																							



SCENARIO VI (Prompt D&D Under RCRA) - TABLE I2

Life-Cycle Cost Estimate for On-Site Waste Disposal Facility														COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility			The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																			
Location:	Portsmouth, OH																						
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																						
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]			Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																			
Base Year:	4 <sup>th</sup> Quarter, FY 2006																						
Date:	August 2006																						
LIFE-CYCLE COSTS IN DOLLARS																							
Cost Category ID	Cost Category Description			Fiscal Year																			
2	Disposal Costs			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2A	Capital Construction Cost			\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$17,151,000	\$17,577,000	\$18,003,000	\$18,444,000	\$18,900,000	\$19,341,000	\$19,812,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B	Disposal Facility Operational Cost			\$0	\$0	\$0	\$0	\$12,780,000	\$13,097,000	\$13,415,000	\$13,743,000	\$9,388,000	\$9,607,000	\$9,842,000	\$10,083,000	\$10,333,000	\$10,582,000	\$10,846,000	\$11,103,000	\$11,367,000	\$11,647,000	\$11,926,000	\$0
2C	Closure Cost			\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,071,000	\$6,212,000	\$6,364,000	\$6,520,000	\$6,681,000	\$6,842,000	\$7,013,000	\$7,179,000	\$7,350,000	\$7,531,000	\$15,422,000	\$15,793,000
3	Total Project Cost (Escalated without Contingency)			\$18,134,000	\$12,384,000	\$32,691,000	\$33,481,000	\$29,931,000	\$30,674,000	\$31,418,000	\$32,187,000	\$34,359,000	\$35,160,000	\$36,018,000	\$16,603,000	\$17,014,000	\$17,424,000	\$17,859,000	\$18,282,000	\$18,717,000	\$19,178,000	\$27,348,000	\$15,793,000
4	Contingency 20% (DOE-Held)			\$3,627,000	\$2,477,000	\$6,538,000	\$6,696,000	\$5,986,000	\$6,135,000	\$6,284,000	\$6,437,000	\$6,872,000	\$7,032,000	\$7,204,000	\$3,321,000	\$3,403,000	\$3,485,000	\$3,572,000	\$3,656,000	\$3,743,000	\$3,836,000	\$5,470,000	\$3,159,000
5	Total Project Cost (Escalated)			\$21,761,000	\$14,861,000	\$39,229,000	\$40,177,000	\$35,917,000	\$36,809,000	\$37,702,000	\$38,624,000	\$41,231,000	\$42,192,000	\$43,222,000	\$19,924,000	\$20,417,000	\$20,909,000	\$21,431,000	\$21,938,000	\$22,460,000	\$23,014,000	\$32,818,000	\$18,952,000
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3			TPC (LIFE CYCLE DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Escalation Index was calculated based on a constant rate of 2.4% after FY 08. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004), under Environmental Management (EM) Project Category. See Table E1, Appendix E.  Life-cycle dollars are escalated from current costs from Table F1. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D4, Appendix D.											
	\$494,655,000			\$593,588,000			<table><tr><td>(-) 30%</td><td>\$415,512,000</td></tr><tr><td>TPC</td><td>\$593,588,000</td></tr><tr><td>(+) 50%</td><td>\$890,382,000</td></tr></table>																
(-) 30%	\$415,512,000																						
TPC	\$593,588,000																						
(+) 50%	\$890,382,000																						

SCENARIO VI (Prompt D&D Under RCRA) - TABLE I3

Present Value Analysis for On-Site Waste Disposal Facility

COST ESTIMATE SUMMARY

Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.
Location:	Portsmouth, OH	
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]	
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	
Base Year:	4 <sup>th</sup> Quarter, FY 2006	
Date:	August 2006	

PRESENT VALUE COSTS IN DOLLARS

Cost Category ID	Cost Category Description	Fiscal Year																					
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026		
2A	Capital Construction Cost	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$13,311,000	\$12,967,000	\$12,624,000	\$12,295,000	\$11,975,000	\$11,649,000	\$11,342,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$9,919,000	\$9,662,000	\$9,407,000	\$9,161,000	\$5,948,000	\$5,786,000	\$5,635,000	\$5,487,000	\$5,345,000	\$5,203,000	\$5,069,000	\$4,933,000	\$4,801,000	\$4,676,000	\$4,551,000	\$0		
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,847,000	\$3,741,000	\$3,643,000	\$3,548,000	\$3,456,000	\$3,364,000	\$3,278,000	\$3,190,000	\$3,105,000	\$3,024,000	\$5,885,000	\$5,730,000		
3	Total Project Cost (without Contingency)	\$17,236,000	\$11,189,000	\$28,078,000	\$27,334,000	\$23,230,000	\$22,629,000	\$22,031,000	\$21,456,000	\$21,770,000	\$21,176,000	\$20,620,000	\$9,035,000	\$8,801,000	\$8,567,000	\$8,347,000	\$8,123,000	\$7,906,000	\$7,700,000	\$10,436,000	\$5,730,000		
4	Contingency 20% (DOE-Held)	\$3,447,000	\$2,238,000	\$5,616,000	\$5,467,000	\$4,646,000	\$4,526,000	\$4,406,000	\$4,291,000	\$4,354,000	\$4,235,000	\$4,124,000	\$1,807,000	\$1,760,000	\$1,713,000	\$1,669,000	\$1,625,000	\$1,581,000	\$1,540,000	\$2,087,000	\$1,146,000		
5	Total Project Cost (Present Value)	\$20,683,000	\$13,427,000	\$33,694,000	\$32,801,000	\$27,876,000	\$27,155,000	\$26,437,000	\$25,747,000	\$26,124,000	\$25,411,000	\$24,744,000	\$10,842,000	\$10,561,000	\$10,280,000	\$10,016,000	\$9,748,000	\$9,487,000	\$9,240,000	\$12,523,000	\$6,876,000		
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (PRESENT VALUE DOLLARS) SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<b>NOTES:</b> This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. <b>2A:</b> The costs presented for FY07 include EE/CA preparation; the costs for FY07 through FY08 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. <b>2B:</b> Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). <b>2C:</b> Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. Discount Rate of 5.2% was used to determine present value costs per Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent). See Table E3, Appendix E. Present value dollars are discounted from life-cycle costs from Table F2. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D4, Appendix D.													
	\$311,394,000	\$373,672,000			<table><tr><td>(-) 30%</td><td>\$261,570,000</td></tr><tr><td>TPC</td><td>\$373,672,000</td></tr><tr><td>(+) 50%</td><td>\$560,508,000</td></tr></table>																		
(-) 30%	\$261,570,000																						
TPC	\$373,672,000																						
(+) 50%	\$560,508,000																						

## Appendix J

### Annualized Cost Estimates for Scenario VIII (Current, Life-Cycle, and Present Value Costs)

SCENARIO VIII (Two Phase D&D with Funding Constraints) - TABLE J1																					
Current (FY 2006) Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY			
Site:	On-Site Waste Disposal Facility	<p>The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&amp;D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.</p> <p>Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&amp;D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&amp;D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&amp;C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.</p>																			
Location:	Portsmouth, OH																				
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																				
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																				
Base Year:	4 <sup>th</sup> Quarter, FY 2006																				
Date:	August 2006																				
CURRENT COSTS IN DOLLARS																					
Cost Category ID	Cost Category Description	Fiscal Year																			
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2A	Capital Construction Cost	\$2,952,000	\$2,952,000	\$7,871,000	\$7,871,000	\$7,871,000	\$16,725,000	\$16,725,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000	\$8,363,000
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,529,000	\$6,529,000	\$6,529,000	\$6,529,000	\$6,529,000	\$0	\$6,529,000	\$6,529,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,718,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3	Total Project Cost (without Contingency)	\$2,952,000	\$2,952,000	\$7,871,000	\$7,871,000	\$7,871,000	\$16,725,000	\$16,725,000	\$14,892,000	\$14,892,000	\$14,892,000	\$14,892,000	\$14,892,000	\$14,892,000	\$11,081,000	\$14,892,000	\$14,892,000	\$15,565,000	\$15,565,000	\$15,565,000	\$15,565,000
4	Contingency 20% (DOE-Held)	\$590,000	\$590,000	\$1,574,000	\$1,574,000	\$1,574,000	\$3,345,000	\$3,345,000	\$2,978,000	\$2,978,000	\$2,978,000	\$2,978,000	\$2,978,000	\$2,978,000	\$2,216,000	\$2,978,000	\$2,978,000	\$3,113,000	\$3,113,000	\$3,113,000	\$3,113,000
5	Total Project Cost (TPC)	\$3,542,000	\$3,542,000	\$9,445,000	\$9,445,000	\$9,445,000	\$20,070,000	\$20,070,000	\$17,870,000	\$17,870,000	\$17,870,000	\$17,870,000	\$17,870,000	\$17,870,000	\$13,297,000	\$17,870,000	\$17,870,000	\$18,678,000	\$18,678,000	\$18,678,000	\$18,678,000
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043			
2A	Capital Construction Cost	\$8,363,000	\$8,363,000	\$8,363,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
2B	Disposal Facility Operational Cost	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$0	\$0	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$4,353,000	\$0			
2C	Closure Cost	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$2,849,000	\$5,697,000	\$5,697,000			
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$2,718,000	\$2,718,000	\$0	\$0	\$0	\$0	\$0	\$0			
3	Total Project Cost (without Contingency)	\$15,565,000	\$15,565,000	\$15,565,000	\$7,202,000	\$7,202,000	\$7,202,000	\$7,202,000	\$7,202,000	\$7,202,000	\$5,567,000	\$5,567,000	\$7,202,000	\$7,202,000	\$7,202,000	\$7,202,000	\$10,050,000	\$5,697,000			
4	Contingency 20% (DOE-Held)	\$3,113,000	\$3,113,000	\$3,113,000	\$1,440,000	\$1,440,000	\$1,440,000	\$1,440,000	\$1,440,000	\$1,440,000	\$1,113,000	\$1,113,000	\$1,440,000	\$1,440,000	\$1,440,000	\$1,440,000	\$2,010,000	\$1,139,000			
5	Total Project Cost	\$18,678,000	\$18,678,000	\$18,678,000	\$8,642,000	\$8,642,000	\$8,642,000	\$8,642,000	\$8,642,000	\$8,642,000	\$6,680,000	\$6,680,000	\$8,642,000	\$8,642,000	\$8,642,000	\$8,642,000	\$12,060,000	\$6,836,000			
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (CURRENT DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					<div>NOTES:</div> <div>This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC.</div> <div>The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&amp;D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&amp;D schedule.</div> <div>2A: The costs presented for FY07 and FY08 include EE/CA preparation; the costs for FY09 through FY11 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities.</div> <div>2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment).</div> <div>2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements.</div> <div>2E: Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during delays to waste disposal activities.</div> <div>Disposal activity schedules are presented in Table 5-3, Section 5.1.</div> <div>Annual costs for each disposal activity were calculated are presented in Table D5, Appendix D.</div> <div>Costs are rounded to the nearest \$1,000.</div>											
	\$401,713,000	\$482,046,000			<table><tr><td>(-) 30%</td><td>\$337,432,000</td></tr><tr><td>TPC</td><td>\$482,046,000</td></tr><tr><td>(+) 50%</td><td>\$723,069,000</td></tr></table>																
(-) 30%	\$337,432,000																				
TPC	\$482,046,000																				
(+) 50%	\$723,069,000																				

SCENARIO VIII (Two Phase D&D with Funding Constraints) - TABLE J2																												
Life-Cycle Cost Estimate for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY										
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.																										
Location:	Portsmouth, OH																											
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																											
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																											
Base Year:	4 <sup>th</sup> Quarter, FY 2006																											
Date:	August 2006																											
LIFE-CYCLE COSTS IN DOLLAR																												
Cost Category ID	Cost Category Description	Fiscal Year																										
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026							
2A	Capital Construction Cost	\$3,023,000	\$3,097,000	\$8,461,000	\$8,666,000	\$8,878,000	\$19,334,000	\$19,802,000	\$10,144,000	\$10,395,000	\$10,638,000	\$10,897,000	\$11,165,000	\$11,441,000	\$11,717,000	\$12,009,000	\$12,294,000	\$12,586,000	\$12,896,000	\$13,205,000	\$13,523,000							
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$7,920,000	\$8,116,000	\$8,305,000	\$8,507,000	\$8,716,000	\$0	\$9,147,000	\$9,376,000	\$6,399,000	\$6,551,000	\$6,712,000	\$6,873,000	\$7,039,000							
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$4,188,000	\$4,288,000	\$4,393,000	\$4,499,000	\$4,607,000							
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$3,718,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0							
3	Total Project Cost (Escalated without Contingency)	\$3,023,000	\$3,097,000	\$8,461,000	\$8,666,000	\$8,878,000	\$19,334,000	\$19,802,000	\$18,064,000	\$18,511,000	\$18,943,000	\$19,404,000	\$19,881,000	\$15,159,000	\$20,864,000	\$21,385,000	\$22,881,000	\$23,425,000	\$24,001,000	\$24,577,000	\$25,169,000							
4	Contingency 20% (DOE-Held)	\$605,000	\$619,000	\$1,692,000	\$1,733,000	\$1,776,000	\$3,867,000	\$3,960,000	\$3,613,000	\$3,702,000	\$3,789,000	\$3,881,000	\$3,976,000	\$3,032,000	\$4,173,000	\$4,277,000	\$4,576,000	\$4,685,000	\$4,800,000	\$4,915,000	\$5,034,000							
5	Total Project Cost (Escalated)	\$3,628,000	\$3,716,000	\$10,153,000	\$10,399,000	\$10,654,000	\$23,201,000	\$23,762,000	\$21,677,000	\$22,213,000	\$22,732,000	\$23,285,000	\$23,857,000	\$18,191,000	\$25,037,000	\$25,662,000	\$27,457,000	\$28,110,000	\$28,801,000	\$29,492,000	\$30,203,000							
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043										
2A	Capital Construction Cost	\$13,849,000	\$14,184,000	\$14,527,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0										
2B	Disposal Facility Operational Cost	\$7,209,000	\$7,383,000	\$7,561,000	\$7,740,000	\$7,931,000	\$8,123,000	\$8,323,000	\$8,523,000	\$8,728,000	\$0	\$0	\$9,381,000	\$9,607,000	\$9,842,000	\$10,077,000	\$10,321,000	\$0										
2C	Closure Cost	\$4,718,000	\$4,832,000	\$4,949,000	\$5,066,000	\$5,191,000	\$5,316,000	\$5,447,000	\$5,578,000	\$5,712,000	\$5,852,000	\$5,994,000	\$6,140,000	\$6,288,000	\$6,442,000	\$6,595,000	\$13,508,000	\$13,832,000										
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,583,000	\$5,719,000	\$0	\$0	\$0	\$0	\$0	\$0										
3	Total Project Cost (Escalated without Contingency)	\$25,776,000	\$26,399,000	\$27,037,000	\$12,806,000	\$13,122,000	\$13,439,000	\$13,770,000	\$14,101,000	\$14,440,000	\$11,435,000	\$11,713,000	\$15,521,000	\$15,895,000	\$16,284,000	\$16,672,000	\$23,829,000	\$13,832,000										
4	Contingency 20% (DOE-Held)	\$5,155,000	\$5,280,000	\$5,407,000	\$2,561,000	\$2,624,000	\$2,688,000	\$2,754,000	\$2,820,000	\$2,888,000	\$2,287,000	\$2,343,000	\$3,104,000	\$3,179,000	\$3,257,000	\$3,334,000	\$4,766,000	\$2,766,000										
5	Total Project Cost (Escalated)	\$30,931,000	\$31,679,000	\$32,444,000	\$15,367,000	\$15,746,000	\$16,127,000	\$16,524,000	\$16,921,000	\$17,328,000	\$13,722,000	\$14,056,000	\$18,625,000	\$19,074,000	\$19,541,000	\$20,006,000	\$28,595,000	\$16,598,000										
TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3		TPC (LIFE CYCLE DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					NOTES: This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 and FY08 include EE/CA preparation; the costs for FY09 through FY11 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. 2E: Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during delays to waste disposal activities.  Escalation Index was calculated based on a constant rate of 2.4% after FY 08. This constant rate of 2.4% was obtained from "Escalation Rate Assumptions For DOE Projects" (January 2004), under Environmental Management (EM) Project Category. See Table E1, Appendix E.  Life-cycle dollars are escalated from current costs from Table F1. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D5, Appendix D.																		
\$629,596,000		\$755,514,000			<table><tr><td>(-) 30%</td><td>\$528,860,000</td></tr><tr><td>TPC</td><td>\$755,514,000</td></tr><tr><td>(+) 50%</td><td>\$1,133,271,000</td></tr></table>					(-) 30%	\$528,860,000	TPC	\$755,514,000	(+) 50%	\$1,133,271,000													
(-) 30%	\$528,860,000																											
TPC	\$755,514,000																											
(+) 50%	\$1,133,271,000																											

SCENARIO VIII (Two Phase D&D with Funding Constraints) - TABLE J3																											
Present Value Analysis for On-Site Waste Disposal Facility																		COST ESTIMATE SUMMARY									
Site:	On-Site Waste Disposal Facility	The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m3 of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.																									
Location:	Portsmouth, OH																										
Phase:	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]																										
Classification:	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]																										
Base Year:	4 <sup>th</sup> Quarter, FY 2006																										
Date:	August 2006																										
PRESENT VALUE COSTS IN DOLLARS																											
Cost Category ID	Cost Category Description	Fiscal Year																									
2	Disposal Costs	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026						
2A	Capital Construction Cost	\$2,873,000	\$2,798,000	\$7,267,000	\$7,075,000	\$6,890,000	\$14,263,000	\$13,885,000	\$6,762,000	\$6,586,000	\$6,407,000	\$6,239,000	\$6,076,000	\$5,918,000	\$5,761,000	\$5,613,000	\$5,462,000	\$5,316,000	\$5,178,000	\$5,039,000	\$4,906,000						
2B	Disposal Facility Operational Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$5,279,000	\$5,142,000	\$5,002,000	\$4,870,000	\$4,743,000	\$0	\$4,498,000	\$4,382,000	\$2,843,000	\$2,767,000	\$2,695,000	\$2,623,000	\$2,554,000						
2C	Closure Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,861,000	\$1,811,000	\$1,764,000	\$1,717,000	\$1,671,000						
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,923,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0						
3	Total Project Cost (without Contingency)	\$2,873,000	\$2,798,000	\$7,267,000	\$7,075,000	\$6,890,000	\$14,263,000	\$13,885,000	\$12,041,000	\$11,728,000	\$11,409,000	\$11,109,000	\$10,819,000	\$7,841,000	\$10,259,000	\$9,995,000	\$10,166,000	\$9,894,000	\$9,637,000	\$9,379,000	\$9,131,000						
4	Contingency 20% (DOE-Held)	\$575,000	\$560,000	\$1,453,000	\$1,415,000	\$1,378,000	\$2,853,000	\$2,777,000	\$2,408,000	\$2,346,000	\$2,282,000	\$2,222,000	\$2,164,000	\$1,568,000	\$2,052,000	\$1,999,000	\$2,033,000	\$1,979,000	\$1,927,000	\$1,876,000	\$1,826,000						
5	Total Project Cost (Present Value)	\$3,448,000	\$3,358,000	\$8,720,000	\$8,490,000	\$8,268,000	\$17,116,000	\$16,662,000	\$14,449,000	\$14,074,000	\$13,691,000	\$13,331,000	\$12,983,000	\$9,409,000	\$12,311,000	\$11,994,000	\$12,199,000	\$11,873,000	\$11,564,000	\$11,255,000	\$10,957,000						
2	Disposal Costs	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043									
2A	Capital Construction Cost	\$4,775,000	\$4,650,000	\$4,527,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0									
2B	Disposal Facility Operational Cost	\$2,486,000	\$2,420,000	\$2,356,000	\$2,293,000	\$2,233,000	\$2,174,000	\$2,117,000	\$2,061,000	\$2,007,000	\$0	\$0	\$1,852,000	\$1,803,000	\$1,756,000	\$1,709,000	\$1,664,000	\$0									
2C	Closure Cost	\$1,627,000	\$1,584,000	\$1,542,000	\$1,501,000	\$1,461,000	\$1,423,000	\$1,386,000	\$1,349,000	\$1,313,000	\$1,279,000	\$1,245,000	\$1,212,000	\$1,180,000	\$1,149,000	\$1,119,000	\$2,177,000	\$2,119,000									
2E	Short Term Stewardship Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,220,000	\$1,188,000	\$0	\$0	\$0	\$0	\$0	\$0									
	Total Project Cost (without Contingency)	\$8,888,000	\$8,654,000	\$8,425,000	\$3,794,000	\$3,694,000	\$3,597,000	\$3,503,000	\$3,410,000	\$3,320,000	\$2,499,000	\$2,433,000	\$3,064,000	\$2,983,000	\$2,905,000	\$2,828,000	\$3,841,000	\$2,119,000									
	Contingency 20% (DOE-Held)	\$1,778,000	\$1,731,000	\$1,685,000	\$759,000	\$739,000	\$719,000	\$701,000	\$682,000	\$664,000	\$500,000	\$487,000	\$613,000	\$597,000	\$581,000	\$566,000	\$768,000	\$424,000									
	Total Project Cost (Present Value)	\$10,666,000	\$10,385,000	\$10,110,000	\$4,553,000	\$4,433,000	\$4,316,000	\$4,204,000	\$4,092,000	\$3,984,000	\$2,999,000	\$2,920,000	\$3,677,000	\$3,580,000	\$3,486,000	\$3,394,000	\$4,609,000	\$2,543,000									
	TPC (WITHOUT CONTINGENCY) - SUM OF COST CATEGORY 3	TPC (PRESENT VALUE DOLLARS) - SUM OF COST CATEGORY 5			TPC ACCURACY RANGE (CLASS 5 ESTIMATE)					NOTES: This cost estimate was developed using parametric (top-down) and specific analogy techniques. The cost sources were from other DOE facilities currently using onsite cells for waste disposal. Since the other cost sources did not provide detailed annualized cost breakdowns, the accuracy for annualized costs presented here may be less than for the TPC. The annualized cost projections for OSWDF activities are based on the preliminary waste generation schedule for the demolition and disposal (D&D) activities and the anticipated sequencing of OSWDF activities in relation to this schedule. The annualized schedule for OSWDF activities and related costs are subjected to change as conceptual cell design progress or in response to changes in the D&D schedule. 2A: The costs presented for FY07 and FY08 include EE/CA preparation; the costs for FY09 through FY11 include design and procurement activities. Costs for remaining years include but are not limited to actual construction of the disposal facility and support facilities. 2B: Costs include but are not limited to operation of the disposal facility (placement of wastes and interim cover) and operation of support facilities (such as leachate management and treatment). 2C: Costs include but are not limited to closure of the disposal facility (placement of final cover) and closure documentation and inspection requirements. 2E: Cost include but are not limited to stewardship of the disposal facility (interim cover maintenance, leachate management, and monitoring) during delays to waste disposal activities.  Discount Rate of 5.2% was used to determine present value costs per Appendix C (Revised January 2006), OMB Circular No. A-94, Nominal Interest Rates on Treasury Notes and Bonds of Specific Maturities (in Percent). See Table E3, Appendix E. Present value dollars are discounted from life-cycle costs from Table F2. Costs are rounded to the nearest \$1,000. Disposal activity schedules are presented in Table 5-3, Section 5.1. Annual costs for each disposal activity were calculated are presented in Table D5, Appendix D.																	
	\$258,416,000	\$310,103,000			<table><tr><td>(-) 30%</td><td>\$217,072,000</td></tr><tr><td>TPC</td><td>\$310,103,000</td></tr><tr><td>(+) 50%</td><td>\$465,155,000</td></tr></table>					(-) 30%	\$217,072,000	TPC	\$310,103,000	(+) 50%	\$465,155,000												
(-) 30%	\$217,072,000																										
TPC	\$310,103,000																										
(+) 50%	\$465,155,000																										

## Appendix K

Cost Estimate for Sand and Grout Filling of Converter Voids  
(Current FY 2006 Cost)

Table K1

## Estimate for Sand Filling of Converter Voids

Converter Void Volume Info <sup>1</sup>					Material Cost <sup>2</sup>		Labor Cost <sup>3,4</sup>				Equipment Cost <sup>5</sup>		Total Cost	Unit Cost	
Type of Converter	Volume of Void per Unit per Type (ft <sup>3</sup> )	Volume of Void per Unit per Type (m <sup>3</sup> )	Quantity of Converters	Total Volume of Void per Type (m <sup>3</sup> )	Unit Price of Sand <sup>2</sup> (\$/m <sup>3</sup> )	Cost of Sand for Filling	Days to Fill Converter Voids (Days per Converter)	Cost of Labor <sup>3</sup> (\$/Hr)	Cost of Labor (\$/day)	Total Labor Cost	Estimated Cost of Equipment (\$/day)	Total Equipment Cost	Total Cost of Work	Unit Cost per Converter Type (\$/m <sup>3</sup> )	Average Unit Cost (\$/m <sup>3</sup> ) <sup>6</sup>
X-33	2,311	65.44	656	42,929	\$28.82	\$1,237,214	2	\$251.42	\$2,012	\$2,639,744	\$1,000	\$1,312,000	\$5,188,958	\$121	
X-31	802	22.71	500	11,355		\$327,252	1			\$1,006,000		\$500,000	\$1,833,252	\$162	
X-29	776	21.97	600	13,182		\$379,906	1			\$1,207,200		\$600,000	\$2,187,106	\$166	
X-33	775	21.95	656	14,400		\$415,008	1			\$1,319,872		\$656,000	\$2,390,880	\$167	
X-31	343	9.71	500	4,855		\$139,922	0.5			\$503,000		\$250,000	\$892,922	\$184	
X-29	304	8.61	600	5,166		\$148,885	0.5			\$603,600		\$300,000	\$1,052,485	\$204	
<b>Total</b>				<b>91,887</b>		<b>\$2,648,187</b>				<b>\$7,279,416</b>		<b>\$3,618,000</b>	<b>\$13,545,603</b>		<b>\$167.33</b>

**Note:**

1. Void volumes within converters are based on the volume calculations provided by "Theta Pro2Serve Management Company, LLC"

2. Estimated local material cost for sand of \$20/cy delivered into stockpiles, converted to \$/m<sup>3</sup> (factor of 1m<sup>3</sup> = 1.31cy used). A 10 percent markup is included to account for use of cleared delivery personnel. Water is assumed to be available at no charge at the location.

3. Labor cost provided by PT&C for the D&D portion of the work; assume 3 hazardous material handlers @ \$46.09/hr for each, 1 Operating Engineer (Group 1) @ \$49.68/hr, and 1 foreman @ \$63.47/hr. Labor productivity estimated by CDM and assumes preparation by D&D personnel to allow

4. Productivity for labor assumes that all the units have been sufficiently opened to allow filling sand slurry by pumping method. Assumed activities include the the use of skid steer loader or backhoe to place sand in the hopper and use of slurry pump to place sand slurry in the converter. Tampers will used to compact the slurry and to make sure the voids are completely filled.

5. Assumes allowance of \$1000/day for equipment. The exact type of equipment cannot be ascertained due to the unknown of the internal converter configurations; however slurry placement of grout is assumed so equipment may include skid steer loader or backhoe, mixer and hopper, slurry pump and tampers.

6. Calculated from average of unit cost per converter types.

Table K2

## Estimate for Grout Filling of Converter Voids

Converter Void Volume Info <sup>1</sup>					Material Cost <sup>2</sup>		Labor Cost <sup>3,4</sup>				Equipment Cost <sup>5</sup>		Total Cost	Unit Cost	
Type of Converter	Volume of Void per Unit per Type (ft <sup>3</sup> )	Volume of Void per Unit per Type (m <sup>3</sup> )	Quantity of Converters	Total Volume of Void per Type (m <sup>3</sup> )	Unit Price of Grout <sup>2</sup> (\$/m <sup>3</sup> )	Cost of Grout for Filling	Days to Fill Converter Voids (Days per Converter)	Cost of Labor <sup>3</sup> (\$/Hr)	Cost of Labor (\$/day)	Total Labor Cost	Estimated Cost of Equipment (\$/day)	Total Equipment Cost	Total Cost of Work	Unit Cost per Converter Type (\$/m <sup>3</sup> )	Average Unit Cost (\$/m <sup>3</sup> ) <sup>6</sup>
X-33	2,311	65.44	656	42,929	\$115.28	\$4,948,856	1	\$251.42	\$2,012	\$1,319,872	\$700	\$459,200	\$6,727,928	\$157	
X-31	802	22.71	500	11,355		\$1,309,005	0.5			\$503,000		\$175,000	\$1,987,005	\$175	
X-29	776	21.97	600	13,182		\$1,519,621	0.5			\$603,600		\$210,000	\$2,333,221	\$178	
X-33	775	21.95	656	14,400		\$1,660,032	0.5			\$659,936		\$229,600	\$2,549,568	\$178	
X-31	343	9.71	500	4,855		\$559,685	0.25			\$251,500		\$87,500	\$898,685	\$186	
X-29	304	8.61	600	5,166		\$595,537	0.25			\$301,800		\$105,000	\$1,002,337	\$195	
<b>Total</b>				<b>91,887</b>		<b>\$10,592,736</b>				<b>\$3,639,708</b>		<b>\$1,266,300</b>	<b>\$15,498,744</b>		<b>\$178.17</b>

**Note:**

1. Void volumes within converters are based on the volume calculations provided by "Theta Pro2Serve Management Company, LLC"

2. Estimated local material cost for grout of \$80/cy delivered by direct chute method, converted to \$/m<sup>3</sup> (factor of 1m<sup>3</sup> = 1.31cy used). A 10 percent markup is included to account for use of cleared delivery personnel. Water is assumed to be available at no charge at the location.

3. Labor cost provided by PT&C for the D&D portion of the work; assume 3 hazardous material handlers @ \$46.09/hr for each, 1 Operating Engineer (Group 1) @ \$49.68/hr, and 1 foreman @ \$63.47/hr. Labor productivity estimated by CDM and assumes preparation by D&D personnel to allow

4. Productivity for labor assumes that all the units have been sufficiently opened to allow filling grout slurry by gravity displacement or pumping method. Assumed activities include the the use of concrete truck to place the grout slurry in the converter through the sluice or by using a grout pump. Tampers will used to compact the slurry and to make sure the voids are completely filled.

5. Assumes allowance of \$700/day for equipment. The exact type of equipment cannot be ascertained due to the unknown of the internal converter configurations; however slurry placement of grout is assumed so equipment may include grout pump and tampers. Concrete truck is included in material costs.

6. Calculated from average of unit cost per converter types.



Table K3

**Current (FY 2006) Cost Estimate for Sand Filling of Converter Voids**

**COST ESTIMATE SUMMARY**

<b>Site:</b> On-Site Waste Disposal Facility <b>Location:</b> Portsmouth, OH <b>Phase:</b> Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range] <b>Classification:</b> Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%] <b>Base Year:</b> 4 <sup>th</sup> Quarter, FY 2006 <b>Date:</b> August 2006	<b>Description:</b> The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m <sup>3</sup> of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.
--	---

**CURRENT COSTS IN DOLLARS**

DESCRIPTION	QUANTITY	UNIT(S)	AVERAGE UNIT COST (\$/m <sup>3</sup> )	TOTAL	NOTES
Filling Voids with Sand	91,887	m <sup>3</sup>	\$167.33	\$15,375,452	Average unit cost from Table K-1
<b>SUBTOTAL</b>				<b>\$15,375,452</b>	Total disposal costs (voids are inclusive to total volume)
Contingency (Scope and Bid)	20%			\$3,075,090	20 % contingency is an assumed value
<b>SUBTOTAL</b>				<b>\$18,450,542</b>	
<b>TOTAL CURRENT FY 2006 COST</b>				<b>\$18,451,000</b>	Rounded up to the nearest thousand

**COST ACCURACY RANGE (CLASS 5 ESTIMATE)**

Range	Cost
(-) 30%	\$12,916,000
(+) 50%	\$27,677,000

Table K4

**Current (FY 2006) Cost Estimate for Grout Filling of Converter Voids**

**COST ESTIMATE SUMMARY**

<b>Site:</b>	On-Site Waste Disposal Facility	<b>Description:</b> The PORTS Gaseous Diffusion Plant (GDP) is located in south central Ohio in rural Pike County; approximately 22 miles north of Portsmouth. Uranium enrichment operations at the GDP began in the early 1950s to supply both high and low enriched uranium for defense purposes and commercial use. After the decommissioning of the extensive facilities that supported the gaseous diffusion process is now scheduled to be demolished and disposed to a proposed on-site waste disposal facility (OSWDF) at Portsmouth. The PORTS D&D Project includes the decontamination and decommissioning, and demolition of 134 facilities. The 134 facilities comprise nearly 10,600,000 square feet of floor space, which accounts for approximately 1.67 million m <sup>3</sup> of all wastes to be disposed on-site under CERCLA. Based on this information historical cost analysis was done for various disposal sites with similar scope and a cost estimate for the proposed on-site facility was prepared.  Costs for pre-disposal (preparation, packaging, and transportation costs) of all waste generated during PORTS D&D project are not included in this cost estimate. The estimate for pre-disposal costs are included in the cost estimate for PORTS D&D prepared by United States Army Corps of Engineers (USACE) and Project Time and Cost Inc. (PT&C), although a general description, detail background information of cost data and statistical analysis of pre-disposal costs is included in the report text.
<b>Location:</b>	Portsmouth, OH	
<b>Phase:</b>	Critical Decision (CD)-1 [Approve Alternative Selection and Cost Range]	
<b>Classification:</b>	Class 5 (Order of Magnitude Estimate) [Overall Cost Accuracy: -30% to +50%]	
<b>Base Year:</b>	4 <sup>th</sup> Quarter, FY 2006	
<b>Date:</b>	August 2006	

**CURRENT COSTS IN DOLLARS**

DESCRIPTION	QUANTITY	UNIT(S)	AVERAGE UNIT COST (\$/m <sup>3</sup> )	TOTAL	NOTES
Filling Voids with Grout	91,887	m <sup>3</sup>	\$178.17	\$16,371,507	Average unit cost from Table K-2
<b>SUBTOTAL</b>				<b>\$16,371,507</b>	Total disposal costs (voids are inclusive to total volume)
Contingency (Scope and Bid)	20%			\$3,274,301	20 % contingency is an assumed value
<b>SUBTOTAL</b>				<b>\$19,645,808</b>	
<b>TOTAL CURRENT FY 2006 COST</b>				<b>\$19,646,000</b>	Rounded up to the nearest thousand

**COST ACCURACY RANGE (CLASS 5 ESTIMATE)**

Range	Cost
(-) 30%	\$13,752,000
(+) 50%	\$29,469,000